Google

This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.

+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.

+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.

+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at http://books.google.com/

E298 E91D Sh 2

LANE
MEDICAL LIBRARY

E. T. Wilkins.

PRACTICE OF SURGERY.

THE

PRACTICE

OF

SURGERY.

BY

JAMES MILLER, F.R.S.E., F.R.C.S.E.,

SURGEON IN ORDINARY TO THE QUEEN FOR SCOTLAND;
SURGEON IN ORDINARY TO HIS ROYAL HIGHNESS PRINCE ALBERT FOR SCOTLAND;
PROFESSOR OF SURGERY IN THE UNIVERSITY OF EDINBURGH;
CONSULTING SURGEON TO THE ROYAL INFIRMARY;
ETC. ETC. ETC.

THIRD AMERICAN, FROM THE SECOND EDINBURGH EDITION.

EDITED, WITH ADDITIONS,

BY F. W. SARGENT, M.D.,

ONE OF THE SURGEONS TO WILLS HOSPITAL.

Illustrated by Three Hundred and Nineteen Engravings on Wood.

PHILADELPHIA:
BLANCHARD AND LEA.
1853.

Entered according to the Act of Congress, in the year 1853, by

BLANCHARD AND LEA,

in the Office of the Clerk of the District Court of the United States in and for the Eastern District of Pennsylvania.

PHILADELPHIA:
T. K. AND P. G. COLLINS, PRINTERS.

LANE LIBRARY

M64
1853

THE EDITOR'S PREFACE.

In preparing the present Edition of Professor Miller's Treatise *On the Practice of Surgery*, the Editor has endeavored, so far as he was able, to supply any omissions which the author may have accidentally made, and has suggested such amendments as appeared advisable. The matter thus added will be found incorporated with the text, inclosed in brackets, thus [ ].

A large number of additional wood-cuts have been introduced into the reprint, chiefly to illustrate objects described but not figured by the author. They are taken in most instances from the last edition of Mr. Fergusson's *Practical Surgery*, from Mr. Lawrence's *Treatise on the Eye*, and from Professor Gross's excellent Monograph *On the Diseases and Injuries of the Bladder*.

The favor with which Professor Miller's contributions have been received, renders it unnecessary to pass any encomiums upon them, farther than to state that the Second Edition of the *Practice of Surgery*, of which the present issue is a copy, is a great improvement upon the first; and that, in connection with the volume on the *Principles*, it forms one of the best expositions of the present state of Surgery in the English language.

PHILADELPHIA, July, 1853.

54025

PREFACE TO THE SECOND EDITION.

THE Author's original intention was to write a System or Text-Book of Surgery for the use of his Pupils. It so happened, however, that the Volumes were issued with a considerable interval between their respective dates of publication, and in consequence acquired the appearance of distinct Treatises on the Principles and Practice of Surgery.

In the present Edition, they still differ as to the date of publication; and are intended to retain their accidental character as distinct Treatises; each complete in itself. At the same time, however, it is hoped that, when considered as first and second Volumes of an entire Work, they may be found to constitute a tolerably complete System of Surgery.

The Author has aimed at making the present Volume—The Practice—uniform in all respects with its companion—The Principles. And in the accomplishment of his task he has again to acknowledge the kind assistance of Dr. W. T. Gairdner. He is also indebted to Mr. Walker for revision of the chapter on Affections of the Eye; and to Dr. Matthews Duncan for remodelling the chapter on Affections of the Female Organs.

The Bibliographical references, as in the former Volume, are "selected with a view to usefulness and accessibility, rather than to completeness of illustration." And, in addition to those introduced, the Student is referred generally to the copious record of authorities in Mr. South's excellent translation of Chelius.

51 QUEEN STREET, July, 1852.

CONTENTS.

CHAPTER I.

PAGE

OPERATIONS 18

CHAPTER II.

INJURIES OF THE SCALP.

Bruise of the Scalp 22
Wounds of the Scalp 27
Wounds of the Temporal Artery 30

CHAPTER III.

INJURIES OF THE CRANIUM; AND THEIR CONSEQUENCES.

Concussion of the Brain 32
Compression of the Brain 43
Compression by Extravasation of Blood 47
Extravasation between the Bone and Dura Mater 47
Extravasation of Blood on, or in the Brain 48
Abscess of the Dura Mater 51
Fractures of the Cranium 56
Fissure 56
Fissure at the Base of the Cranium 57
Fracture, without Displacement 60
Fracture with Displacement 60
Punctured Fracture 63
Fracture of the External Table, alone 65
Fracture of the Inner Table, alone 66
Depression without Fracture 66
The Operation of Trephining 66
Wounds of the Brain 69
Lodgement of Foreign Bodies 70
Hernia Cerebri 71
Paracentesis Capitis 76

CHAPTER IV.

DISEASES OF THE SCALP AND CRANIUM.

PAGE

Erysipelas of the Scalp 78
Tumors of the Scalp 79
Pericranitis 81
Affections of the Cranium 82
Fungous Tumors of the Dura Mater 85

CHAPTER V.

AFFECTIONS OF THE ORBIT, AND ITS CONTENTS.

I. Affections of the Orbit.

Orbital Inflammation 88
Wounds of the Orbit 88
Tumors of the Orbit 89

II. Affections of the Eyelids.

Injuries 91
Foreign Bodies 91
Blepharitis 92
Ophthalmia Tarsi 93
Hordeolum 93
Encysted Tumors 94
Hypertrophy of the Upper Eyelid 95
Cancer of the Eyelids 95
Closure of the Eyelids 95
Lagophthalmos 96
Ptosis 97
Trichiasis and Distichiasis 97
Entropion 98
Ectropion 102
Blepharoplastics 104

III. Affections of the Lachrymal Apparatus.

Epiphora 105
Inflammatory Affections of the Lachrymal Sac 105
Fistula Lachrymalis 107
Obstruction of the Nasal Duct 109
Obliteration and Absence of the Nasal Duct 110
Dacryolithes 110
Affections of the Lachrymal Gland 110
Encanthis 111

IV. Affections of the Eyeball.

1. Affections of the Conjunctiva.

	PAGE
Simple Conjunctivitis	112
Purulent Conjunctivitis	115
Strumous Conjunctivitis	119
Granular Conjunctiva	119
Pterygium	121
Pannus	121

2. Affections of the Cornea.

Corneitis	121
Abscess of the Cornea	123
Ulcer of the Cornea	124
Opacities of the Cornea	126
Staphyloma of the Cornea	127
Conical Cornea	129
Over-distension of the Cornea	129

3. Affections of the Sclerotic Coat.

Sclerotitis	130
Staphyloma of the Sclerotic	130

4. Affections of the Choroid Coat.

Choroiditis	131
Muscæ Volitantes	132

5. Affections of the Iris.

Iritis	132
Changes in the Pupil and Iris.	136
Occlusion of the Pupil	137
Formation of Artificial Pupil	137

6. Affections of the Retina.

Retinitis	141
Amaurosis	141

7. Affections of the Crystalline Lens and Capsule.

Cataract	143
Dislocation of the Lens	152

8. Affections of the Humors.

Hydrophthalmia	154
Synchysis Oculi	154
Glaucoma	154
Ophthalmitis	155
Wounds of the Eyeball	155

PAGE

Entozoa 155
Tumors of the Eyeball 156
Extirpation of the Eyeball 156
Congenital Deficiency of the Eyeball 157
Strabismus 157

CHAPTER VI.

AFFECTIONS OF THE NOSE.

Fracture of the Nasal Bones 162
Lipoma of the Nose 162
Nasal Polypus 163
Rhinolithes 167
Epistaxis 167
The passing of Nasal Tubes 170
Foreign Bodies in the Nostrils 170
Congestion of the Schneiderian Membrane 170
Abscess of the Septum Narium 171
Ulcers of the Nostrils 171
Ozæna 172
Lupus 172
Rhinoplastics 173
Partial restoration of the Nose 176

CHAPTER VII.

AFFECTIONS OF THE SUPERIOR MAXILLA.

Collection of fluid in the Antrum 179
Abscess of the Antrum 180
Polypus of the Antrum 180
Tumors of the Superior Maxilla 181
Extirpation of the Superior Maxilla 182

CHAPTER VIII.

AFFECTIONS OF THE FACE.

Wounds of the Face 186
Warts of the Face 186
Erysipelas of the Face 186
Spasm of the Face 186
Neuralgia of the Face 187
Tumors of the Cheek 187
Sinus of the Cheek 188
Salivary Fistula 188
Fracture of the Os Malæ 189

CHAPTER IX.

AFFECTIONS OF THE LIPS.

PAGE

Harelip 190
Ulcers of the Lips 192
Cancrum Oris 195
Cheiloplastics 195

CHAPTER X.

AFFECTIONS OF THE PALATE.

Congenital Deficiency 196
Velosynthesis 196
Ulcer and Exfoliation 199

CHAPTER XI.

AFFECTIONS OF THE TEETH.

Crowded Teeth 200
Caries of the Teeth 200
Toothache 201
Extraction of Teeth 202
Hemorrhage after Extraction 203
Tartar on the Teeth 203
Recession of the Gums 203
Injuries of the Teeth 204

CHAPTER XII.

AFFECTIONS OF THE JAWS.

Parulis 205
Epulis 205
Tumors of the Lower Jaw 206
Extirpation of the Lower Jaw 207
Caries and Necrosis of the Lower Jaw 210
Fracture of the Lower Jaw 210
Dislocation of the Lower Jaw 211
Anchylosis of the Jaw 212

CHAPTER XIII.

AFFECTIONS OF THE TONGUE.

	PAGE
Glossitis	213
Wounds of the Tongue	213
Ulcers of the Tongue	213
Hypertrophy of the Tongue	214
Induration of the Tongue	214
Erectile Tumor of the Tongue	215
Removal of Portions of the Tongue	215
Division of the Frænum Linguæ	216
Ranula	216
Tumors beneath the Tongue	218
Salivary Concretions	219

CHAPTER XIV.

AFFECTIONS OF THE UVULA AND TONSILS.

Œdema of the Uvula	220
Elongation of the Uvula	220
Tonsillitis	221
Abscess of the Tonsil	221
Ulcers of the Tonsils	222
Hypertrophy of the Tonsils	222
Malignant Disease of the Tonsils	224

CHAPTER XV.

AFFECTIONS OF THE PHARYNX.

Pharyngitis	225
Pharyngeal Abscess	225
Stricture of the Pharynx	225
Spasm of the Pharynx	226
Paralysis of the Pharynx	227
Sacculated Pharynx	227
Tumors of the Pharynx	227
Foreign Bodies in the Pharynx	227
The passing of Instruments by the Pharynx	228

CHAPTER XVI.

AFFECTIONS OF THE ŒSOPHAGUS.

Stricture of the Œsophagus	230
Foreign Bodies in the Œsophagus	231
Œsophagotomy	233
Palsy of the Œsophagus	234

CHAPTER XVII.

AFFECTIONS OF THE EAR.

PAGE

Foreign Bodies 235
Polypus of the Ear 235
Otitis 236
Otorrhœa 237
Abscess of the Mastoid Cells 238
Otalgia 239
Deafness 239
Perforation of the Membrana Tympani 242
Hemorrhage from the Ear 242
Hypertrophy of the Auricle 243
Otoplastics 243
Congenital Occlusion of the Meatus 243

CHAPTER XVIII.

AFFECTIONS OF THE NECK.

Glandular Enlargement and Abscess 245
Hydrocele of the Neck 245
Tumors of the Neck 251
Opening of the External Jugular Vein 252
Torticollis 252
Wounds of the Throat 254
Bronchotomy 258
Foreign Bodies in the Windpipe 258
Asphyxia 262
Injuries of the Larynx 262
The accidental swallowing of boiling water, acids, or other irritant fluids . 263
Spasm of the Glottis 264
Laryngitis 265
I. Acute Laryngitis 265
a. Laryngitis Simplex 265
b. Laryngitis Œdematosa 265
c. Laryngitis Fibrinosa 267
Diphtheritis, or Cynanche Membranacea 269
d. Laryngitis Purulenta 269
II. Chronic Laryngitis 269
a. Thickening of Mucous Membrane 269
b. Follicular Disease of Larynx 270
c. Chronic Œdema Glottidis 270
d. Ulceration of the Larynx 271
Warts of the Larynx 273
Stricture of the Windpipe 273
Formation of Matter near the Larynx 274
Laryngotomy 276

PAGE

Tracheotomy 277
Bronchocele, or Goitre 281
Tumors over the Thyroid Gland 285
Enlargement of the Thyro-hyoid Bursa 285
Hernia Bronchalis 285
Disease of the Cervical Vertebræ 285

CHAPTER XIX.

AFFECTIONS OF THE ARTERIES OF THE NECK AND SUPERIOR EXTREMITY.

Deligation of the Carotid 287
Deligation of the Arteria Anonyma 288
Deligation of the Subclavian 288
Deligation of the Axillary 291
Deligation of the Humeral 292
Deligation of the Arteries of the Forearm 293
Wounds of the Palmar Arch 294

CHAPTER XX.

AFFECTIONS AT THE BEND OF THE ARM.

Venesection 295
Accidents of Venesection 296
Affections of the Bursa over the Olecranon 297

CHAPTER XXI.

AFFECTIONS OF THE WRIST AND HAND.

Ganglia, and Thecal Collections 298
Paronychia 298
Onychia 300
Onyxis 300
Contraction of the Palmar Fascia 301
Tumors of the Metacarpal Bones and Phalanges 301
Other Diseases of the Metacarpal Bones and Phalanges . . . 302
Hypertrophy of the Fingers 303
Congenital Deformities of the Hand 303

CHAPTER XXII.

DISEASES OF THE ARTICULATIONS OF THE SUPERIOR EXTREMITY.

Disease of the Shoulder-Joint 304
Resection of the Shoulder-Joint 305
Resection of the Elbow-Joint 307
Resection of the Wrist 308

CHAPTER XXIII.

INJURIES OF THE SUPERIOR EXTREMITY.

Fractures.

	PAGE
Fracture of the Clavicle	309
Fracture of the Body of the Scapula	311
Fracture of the Acromion	312
Fracture of the Coracoid Process	312
Fracture of the Neck of the Scapula	313
Fracture of the Neck of the Humerus	314
Fracture of the Shaft of the Humerus	315
Fracture of the Condyles of the Humerus	316
Fracture of the Ulna	317
Fracture of the Radius	318
Fracture of both Radius and Ulna	322
Fracture of the Metacarpal Bones	323
Fracture of the Phalanges	323

Dislocations.

Dislocation of the Clavicle	324
Displacement of the Angle of the Scapula	324
Dislocation of the Humerus, at the Shoulder	325
Dislocation of the Radius and Ulna, at the Elbow	327
Dislocation of the Ulna, at the Elbow	328
Dislocation of the Radius, at the Elbow	329
Compound Dislocation of the Elbow	329
Dislocation of the Wrist	330
Dislocation of the Fingers	331
Dislocation of the Thumb	331

CHAPTER XXIV.

INJURIES AND DISEASES OF THE SPINE.

Concussion of the Spinal Cord	333
Compression of the Spinal Cord	334
Fracture of the Spine	334
Dislocation of the Spine	336
Lateral Curvature of the Spine	337
Disease of the Bodies of the Vertebræ	341
Lumbar and Psoas Abscess	343
Spina Bifida	344
Malignant Disease of the Spine	345

CHAPTER XXV.

INJURIES AND DISEASES OF THE CHEST.

	PAGE
Fracture of the Ribs	346
Dislocation of the Ribs	347
Fracture of the Sternum	347
Caries and Necrosis of the Ribs and Sternum	347
Hernia of the Lungs, or Pneumocele	347
Wounds of the Chest	348
Hæmatothorax	350
Pneumothorax	351
Paracentesis Thoracis	352
Wounds of the Heart	359
Paracentesis Pericardii	359

CHAPTER XXVI.

AFFECTIONS OF THE MAMMA AND MAMMILLA.

Irritable Mamma	361
Mammitis, Acute and Chronic	361
Chronic Abscess	362
Lacteal Tumor	363
Hypertrophy	363
Pendulous Breast	363
Partial Hypertrophy	363
Various Tumors of the Mamma	364
Extirpation of the Mamma	365
Affections of the Mammilla	366

CHAPTER XXVII.

AFFECTIONS OF THE ABDOMEN.

Abscess of the Abdominal Parietes	367
Tumors of the Abdominal Parietes	368
Bruise of the Abdomen	368
Wounds of the Abdomen	369
Artificial Anus	371
Fecal Fistula	372
Pelvic Abscess	373
Retro-Uterine Sanguineous Tumors	374
Ovarian Dropsy and Tumors	374
Fibrous Tumors of the Uterus	381
Gastrostomy	382
Gastrotomy	382
Affections of the Diaphragm	385

CHAPTER XXVIII.

HERNIA.

	PAGE
Reducible Hernia	389
Irreducible Hernia	391
Incarcerated Hernia	392
Strangulated Hernia	392
Oblique-inguinal Hernia	403
Ventro-inguinal Hernia	405
Femoral Hernia	406
Umbilical Hernia	409
The other Varieties of Hernia	409

CHAPTER XXIX.

AFFECTIONS OF THE RECTUM.

Abscess Exterior to the Rectum	412
Rectitis	412
Fistula in Ano	413
Fissure and Ulcer of the Anus	417
Hemorrhoids	419
Polypus of the Rectum	423
Prolapsus Ani	423
Stricture of the Rectum	425
Irritable Rectum	427
Hemorrhage from the Rectum	428
Injuries of the Rectum	429
Foreign Bodies in the Rectum	429
Imperforate Anus	430
Artificial Anus	431

CHAPTER XXX.

CALCULOUS DISEASE.

Urinary Calculi	436
Formation and Varieties of Calculi	446
Renal Calculi	452
Vesical Calculus	454
Treatment of Stone in the Bladder	458
Lithrotripsy	464
Lithotomy	469
Varieties in Lithotomy	480
Palliation of Vesical Calculus	483
Urethral Calculus	483
Prostatic Calculus	485
Calculus in the Female	485

CHAPTER XXXI.

AFFECTIONS OF THE BLADDER.

PAGE

Cystitis 488
Irritable Bladder 490
Hæmaturia 491
Incontinence of Urine 493
Retention of Urine 495
Retention of Urine in the Female 500
Puncture of the Bladder 500
Extravasation of Urine 502
Injuries of the Bladder 504
Tumors of the Bladder 505
Displacement of the Bladder 507

CHAPTER XXXII.

AFFECTIONS OF THE PROSTATE.

Prostatitis 509
Abscess of the Prostate 509
Simple Enlargement of the Prostate 510
Malignant Disease of the Prostate 513

CHAPTER XXXIII.

THE VENEREAL DISEASE.

Gonorrhœa 514
Gonorrhœa in the Female 522
Syphilis 523
The Simple Venereal Ulcer 524
The Ulcer with Elevated Edges, and its Results 526
The Hunterian, or True Chancre 528
The Phagedænic and Sloughing Sores, and their Results . . . 530
Condyloma 534
Bubo 536
A General View of the Subject 538
The Use of Mercury in Syphilis 542
Syphilis in the Child 547
Syphilis in the Female 547
Pseudo Syphilis 548

CHAPTER XXXIV.

AFFECTIONS OF THE URETHRA.

PAGE

Stricture 549
Urinous Abscess 562
Urinary Fistula 563
Laceration of the Urethra 564

CHAPTER XXXV.

AFFECTIONS OF THE TESTICLE.

Orchitis 565
Fungus of the Testicle 567
Scrofulous Testicle 569
Tumors of the Testicle 570
Irritable Testicle 570
Atrophy of the Testicle 571
Hydrocele 571
Hydrocele of the Cord 575
Hæmatocele 576
Cirsocele 577
Tumors of the Cord 579
Castration 579
Impotence 580
Spermatorrhœa 581

CHAPTER XXXVI.

AFFECTIONS OF THE SCROTUM AND PENIS.

Erysipelas of the Scrotum 583
Elephantiasis of the Scrotum 582
Chimney-Sweeper's Cancer 584
Priapism 584
Phymosis 585
Paraphymosis 587
Hypospadias 588
Hyperspadias 589
Imperforate Urethra 589
Malignant Disease of the Penis 589
Amputation of the Penis 590

CHAPTER XXXVII.

AFFECTIONS OF THE FEMALE GENITAL ORGANS.

	PAGE
Inflammation of the Vulva	590
Abscess of the Vulva	592
Thrombus of the Vulva	592
Warty Excrescences of the Vulva	593
Oozing Tumor of the Labium	593
Pruritus of the Vulva	593
Malignant Ulcer of External Parts	594
Tumors of the Labia	594
Hypertrophy of the Clitoris and Nymphæ	594
Fleshy Excrescence in the Orifice of the Urethra	594
Laceration of Perineum	595
Vaginal Fistula	595
Stricture of the Vagina	603
Obliteration of the Vagina	603
Imperforate Vagina or Hymen	603
Foreign Bodies in the Vagina	604
Prolapsus of the Vagina	604
The Passing of the Female Catheter	605
Plugging of the Vagina	606
Leucorrhœa	606
Inversion of the Uterus	612
Prolapsus of the Uterus	614
Displacements of the Uterus	616
Stricture of the Cervix Uteri	617
Uterine Polypus	618
Extirpation of the Cervix Uteri	620
Malignant Disease of the Uterus	621

CHAPTER XXXVIII.

OPERATIONS ON THE BLOODVESSELS OF THE LOWER EXTREMITY.

Deligation of the Aorta	625
Deligation of the Iliacs	626
Deligation of the Femorals	628
Deligation of the Popliteal	631
Deligation of the Tibials	632
Deligation of the Peroneal	634

CHAPTER XXXIX.

AFFECTIONS OF THE JOINTS OF THE LOWER EXTREMITY.

PAGE

Morbus Coxarius 635
Resection of the Hip-Joint 642
Change of Form in the Hip-Joint 642
Affections of the Knee and Ham 643

CHAPTER XL.

INJURIES OF THE LOWER EXTREMITIES.

FRACTURES.

Fractures of the Pelvis 645
Fractures of the Femur 646
Fractures of the Patella 656
Fractures of the Leg 657
Fractures at the Ankle 660
Fractures of the Foot 661

DISLOCATIONS.

Dislocation of the Pelvis 661
Dislocations of the Hip 661
Dislocations of the Knee 668
Dislocations of the Patella 669
Dislocations of the Ankle 669
Dislocations of the Tarsus 671
Dislocation of the Metatarsus 672
Dislocation of the Toes 672

Subluxations and Sprains of the Lower Extremity 673
Injuries of the Tendo Achillis and Gastrocnemius Muscle . . . 673

CHAPTER XLI.

AFFECTIONS OF THE FOOT.

Talipes 675
Flat-foot 678
Podelkoma 679
Corns and Bunions 679
Onyxis and Onychia 681
Exostosis of the Distal Phalanx of the Great Toe 681
Contraction of the Toes 681

CHAPTER XLII.

AMPUTATION.

AMPUTATIONS OF THE SUPERIOR EXTREMITY.

PAGE

Amputation of the Fingers 687
Amputation of the Thumb 690
Amputation of the Wrist 691
Amputation of the Forearm 691
Amputation of the Elbow-Joint 693
Amputation of the Arm 693
Amputation of the Shoulder-Joint 694
Amputation of the Scapula 695

AMPUTATIONS OF THE LOWER EXTREMITY.

Amputation of the Toes 695
Amputations of the Foot 696
Resection of the Ankle 697
Amputation of the Ankle 698
Amputation of the Leg 699
Amputation of the Knee-joint 701
Amputation of the Thigh 702
Amputation of the Hip-joint 703

Affections of Stumps 704

LIST OF ILLUSTRATIONS.

FIGURE		PAGE
1.	Couvre-chef bandage for the head	28
2.	Double-headed roller for the head	28
3.	Four-tailed bandage for the head	29
4.	Compress applied to the temporal artery	30
5.	Extravasation of blood beneath the dura mater	47
6.	Plan of abscess of the dura mater	53
7.	Fissure at the base of the skull	58
8.	Punctured fracture of the cranium	63
9.	Trephining the skull	68
10.	Cancerous ulcer of the scalp	81
11.	Interstitial absorption in progress in the cranium	82
12.	The same advanced	82
13.	Mercurio-syphilitic caries of the skull	83
14.	Ulcer of the cranium healed	84
15.	Ivory exostoses of the frontal bone	84
16.	Large exostoses of the cranium, internal and external	85
17.	Large internal exostoses	85
18.	Encysted tumors of the lower eyelid	94
19.	Entropion of both eyelids	98
20.	Mr. Guthrie's operation for entropion	101
21.	Ectropion of the upper eyelid	102
22.	Ectropion of the lower eyelid	103
23.	Operation for ectropion, by excision	104
24.	Operation for ectropion, *par glissement*	104
25.	Fistula lacrymalis	107
26.	Operation for fistula lacrymalis	107
27.	Style for the lachrymal duct	108
28.	Encanthis	111
29.	Diagram of the vascularity of internal and external ophthalmia	112
30.	Catarrhal conjunctivitis	113
31.	Granular conjunctiva	120
32.	Double Pterygium	121
33.	Corneitis	122
34.	Myocephalon	125
35.	Staphyloma	128
36.	Conical cornea	129
37.	Staphyloma of the sclerotic, in profile	131

FIGURE PAGE
38. The same, in front view 131
39. Iritis 133
40. Iris-knives of Sir W. Adams 138
41. Coretomia 138
42. Maunoir's scissors 139
43. Tyrrell's blunt iris-hook 139
44. Extensive opacity of the cornea 139
45. Corectomia 139
46. Sharp iris-hook 140
47. Extraction of cataract 147
48. Beer's cataract-knife 149
49. Mr. Tyrrell's do. 149
50, 51. Curved cornea knives 149
52. The curette and Daviell's scoop 149
53. Depression of cataract 150
54. Scarpa's needle, front and side view 150
55. Reclination of cataract 150
56. Place for incising the conjunctiva, in strabismus . . . 158
57. Elastic wire speculum for separating the lids 159
58. Small toothed-forceps 159
59. Small probe-pointed scissors 160
60. Small iris-knife 160
61. Blunt silver hook 160
62. Lipoma of the nose 163
63. Mucous polypi of the nose 164
64. Deformity of face, caused by nasal polypi 165
65. Plugging the nostrils, for epistaxis 168
66. Belloc's instrument for the same 169
67. Plan of flap for a new nose 174
68. The same, modified by Mr. Liston 174
69. Partial restoration of the nose 177
70. Abscess of the antrum Highmorianum 180
71. Large osteo-sarcoma of the upper jaw 181
72. Tumor of the upper jaw, with lines of incision for its removal . 182
73. Portrait after the removal of the upper jaw 183
74. The twisted suture 191
75. Malgaigne's operation for harelip 191
76. Instrument for supporting the wound after the operation for harelip 191
77. Simple harelip, and plan of operation 192
78. Double harelip, and plan of operation 192
79. Cancer of the lip 193
80. Plan of operation for the removal of the same 193
81, 82. Plan of operation in cases of extensive destruction of the lip . 194
83. Volsellum 197
84. Plan of staphyloraphe 197
85, 86. Knives employed by Mr. Fergusson in staphyloraphe . . 198
87. View of the parts, in connection with Mr. Fergusson's operation for staphyloraphe 198
88. Caries of tooth 201

FIGURE PAGE
89. Purulent cyst at the fang of a decayed tooth 201
90. Application of the tooth-key 202
91. Forceps for removing teeth from the upper jaw . . . 202
92. Forceps for the lower jaw 202
93. Cyst at the root of a decayed tooth 206
94. Osteosarcoma of the lower jaw 207
95. Osteocephaloma of the lower jaw 207
96. Extirpation of the lower jaw 207
97. Caries and necrosis of the lower jaw 210
98. Four-tailed bandage for fracture of the lower jaw . . . 211
99. Glossitis 213
100. Excavated malignant ulcer of the root of the tongue 214
101. Expansion of the lower jaw, by pressure of the tongue . . 215
102. Salivary calculus 219
103. Excision of the tonsils, by the knife 223
104. Fahnestock's instrument for removal of the tonsil . . . 223
105. Stricture of the gullet 230
106, 107. Forceps for the pharynx and œsophagus 232
108. Mr. Wilde's ear speculum 236
109. Large fibrous tumor of the neck 251
110. Venesection in the neck 252
111. Jörg's apparatus for torticollis 253
112. Wound of the larynx 257
113. Acute œdema glottidis 265
114. False membrane in croup 267
115. Sponge probang for the larynx 268
116. Warts in the larynx 273
117. Stricture of the windpipe 274
118. M. Garin's instrument for opening the trachea . . . 278
119. Ordinary canula for the windpipe 278
120. Dr. Gairdner's tracheal canula 279
121. Specimen of bronchocele 282
122. Cystoid appearance of a section of bronchocele . . . 282
123. Relative position of the subclavian artery 289
124. Deligation of the humeral, radial, ulnar, and palmar arteries . 293
125. Venesection at the bend of the arm 295
126. Loss of the thumb, from paronychia 299
127. Appearance of the bones of the thumb in paronychia, after maceration 299
128. Large enchondroma 302
129. Scrofulous necrosis of the bones of the finger, after maceration . 302
130. The position of the flap after resection of the shoulder-joint . 305
131. Plan of an operation by Mr. Fergusson, for resection of the shoulder-joint 306
132. Appearance of the scapula, in this case, after maceration . . 306
133. Incisions for resection of the elbow 307
134. Caries of the elbow 308
135. Ordinary site of fracture of the clavicle 309
136. Simple bandage for this fracture 310
137. Dr. Fox's apparatus for the same 311

FIGURE		PAGE
138.	Fracture of the body and acromion process of the scapula	312
139.	Fracture of the coracoid process of the scapula	312
140, 141.	Fracture of the glenoid cavity and neck of the scapula	313
142.	Fracture of the olecranon process of the ulna	317
143.	Mr. Mayo's splint, for compound fracture of the forearm	318
144.	Fracture of the distal extremity of the radius	319
145, 146.	Dr. Bond's splint for the same	321
147, 148.	Dr. Hays's splint for the same	322
149.	Partial fracture of the ulna	323
150.	Dislocation of the head of the humerus	325
151.	Dislocation of the radius and ulna, backwards, at the elbow	327
152.	Dislocation of the elbow	328
153.	Dislocation of the radius forwards	329
154.	Compound fracture of the elbow	329
155.	Anterior dislocation of the radius and ulna at the wrist	330
156.	Posterior dislocation of the same	330
157.	Dislocation of the thumb	332
158.	Noose, for restoration of the same	332
159.	Fractured spine	335
160.	Dislocation of the spine, front view	337
161.	The same in profile	337
162, 163.	Permanent curvature of the spine, by rickets	340
164.	Continuous absorption of the bodies of vertebræ, from the pressure of an aortic aneurism	341
165.	Caries of the vertebræ, the bones macerated	342
166.	The same during life	342
167.	Caries of the vertebræ	342
168.	General emphysema	346
169.	Carcinoma of the breast	364
170.	Secondary carcimona of the breast	364
171.	Fungus hæmatodes of the mamma	365
172.	The Glover's suture in wound of the bowel	370
173.	Strangulated hernial protrusion	401
174.	Plan of inguinal hernia	403
175.	Appearance of a large inguinal hernia	404
176.	State of the parts in hernia infantilis	405
177.	Plan of femoral hernia	406
178.	Large femoral hernia	407
179.	Ordinary site and appearance of femoral hernia	407
180.	Strangulated crural hernia	408
181.	Hernia Littrica	410
182.	Plan of operation in fistula in ano	415
183, 184.	Speculum ani	416
185.	Prolapsus ani	423
186.	Stricture of the rectum	426
187.	Urate of ammonia	438
188.	Crystals of uric acid	439
189.	Oxalate of lime	442
190.	Crystals of ammoniaco-magnesian phosphate	443

FIGURE		PAGE
191.	Crystals of cystine	445
192.	Uric calculus	447
193.	Triple phosphate calculus	448
194.	Oxalate of lime and urate of ammonia calculus	448
195.	Mulberry calculus	448
196.	Hempseed calculus	448
197.	Triple phosphate calculus, on a nucleus of uric acid	449
198.	Ammoniaco-magnesian phosphate calculus	449
199.	Fusible calculus	449
200.	Section of the same	449
201.	Cystic-oxide calculus	450
202.	Section of the same	450
203.	Section of an alternating calculus	450
204.	Bladder containing a calculus in fragments	457
205.	Sounding the bladder	459
206.	Double canula and syringe	462
207.	Mr. Weiss's urethral forceps	463
208.	Large screw lithontriptor, of Mr. Weiss	464
209.	Views of the extremity of the same	464
210.	Mr. Fergusson's lithontriptor	464
211.	The same, in its application	465
212.	The same	465
213.	A new French lithontriptor	465
214.	Plan of lithotripsy	468
215.	Plan of the lateral operation of lithotomy	471
216.	Dr. Physick's forceps, for tying the internal pudic artery	476
217.	Instrument for catching urethral calculi	484
218.	Prostatic calculi	485
219.	Weiss's metallic dilator	486
220.	Trocar, for puncturing the bladder by the rectum	501
221.	Plan of the different points for puncturing the bladder	502
222.	Polypous growths from the mucous membrane of the bladder	505
223.	Fungous tumor of the bladder	506
224.	Congenital extrophy of the bladder	507
225.	Ordinary catheter	511
226.	The prostatic catheter	512
227.	Warts on the penis	522
228.	The Hunterian chancre	528
229.	The sloughing sore on the penis	531
230.	Acute phagedæna on the penis	531
231.	Chronic phagedæna on the penis	531
232.	Condylomata	535
233.	Mr. Stafford's straight lancet catheter	559
234.	Mr. Fergusson's instrument for dividing stricture	560
235.	Lallemand's urethral porte caustique	560
236.	Fistula in perineo	563
237.	Acute orchitis	565
238, 239.	Puncture of hydrocele	573
240.	Hæmatocele of the scrotum	576

FIGURE		PAGE
241.	Treatment of varicocele by compression	578
242.	Elephantiasis of the scrotum	584
243.	Chimney-sweeper's cancer	584
244.	Phymosis	585
245.	Paraphymosis	588
246.	Deligation of the external iliacs	626
247.	Deligation of the common iliac	628
248.	Carte's instrument for the treatment of aneurism by compression	629
249.	Ligature of the popliteal	632
250.	Ligature of the posterior tibial, at various points.	633
251.	Ligature of the anterior tibial, at various points	633
252.	Articular caries affecting the hip-joint	636
253.	Wasting of the muscles and elongation of the limb, from disease of the hip-joint.	636
254.	Effects of the advanced stage of morbus coxarius	638
255.	Spontaneous luxation of the hip, in morbus coxarius	638
256.	Anchylosis after morbus coxarius	638
257.	Section of the same	642
258.	Head of the femur and acetabulum altered by chronic deposit	643
259.	Section of the femur thus altered	643
260.	Housemaid's knee	643
261.	Fracture of the neck of the femur, within the capsule	647
262.	Section of the same	647
263.	Impacted fracture through the trochanters	648
264.	Long splint	649
265.	The same applied	649
266.	Dr. Physick's long splint	650
267.	Handkerchief for extension	651
268.	Gaiter for the same purpose	651
269.	"The American splint"	652
270.	MacIntyre's splint, modified by Mr. Liston	654
271.	Diastasis of femur	655
272.	Mr. Lonsdale's apparatus for fracture of the patella	657
273.	Fracture of the fibula, with the splint applied	658
274.	Compound fracture of the leg, on MacIntyre's splint	658
275.	Apparatus for swinging a broken leg	659
276.	Compound and comminuted fracture of the leg	660
277.	Fracture-box	660
278.	Dislocation of the hip on the dorsum ilii	662
279.	Reduction of the same, by the pulleys	663
280.	Dislocation into the ischiatic notch	664
281.	Dislocation into the foramen ovale	665
282.	Reduction of the same	666
283.	Dislocation on the pubes	667
284.	Reduction of the same	667
285.	Compound dislocation of the astragalus	672
286.	Treatment of rupture of the tendo Achillis	673
287.	Talipes equinus	675
288.	The same, after division of the tendo Achillis	675

FIGURE		PAGE
289.	Talipes varus	676
290.	The same, dissected	676
291.	Flat-foot	678
292.	Podelkoma	679
293.	Onyxis of the great toe	681
294.	Exostosis of the great toe	681
295.	The ordinary tourniquet	683
296.	Signorini's compressor	683
297.	Mr. Skey's tourniquet	684
298.	The flap amputation of the thigh	685
299.	The corresponding stump	685
300.	The circular amputation of the thigh	687
301.	The corresponding stump	687
302.	Amputation of the finger	688
303.	Amputation of the three middle fingers	689
304.	Amputation of the thumb and its metacarpal bone	690
305.	Amputation of the wrist	691
306.	The tourniquet applied to the brachial artery	692
307.	Amputation of the forearm	692
308.	Amputation of the arm	693
309.	Amputation of the shoulder	694
310.	Amputation of the foot	697
311.	Amputation of the ankle	698
312.	Malan's flat tourniquet, applied to the popliteal	700
313.	Amputation of the leg	700
314.	The forceps employed	701
315.	Amputation of the thigh	702
316.	Amputation of the hip-joint	703
317.	Neuromata of stump	704
318.	Necrosis of the femur, after amputation	705
319.	Sequestrum detached	705

THE PRACTICE OF SURGERY.

CHAPTER I.

OPERATIONS.

It is a favorite phrase, by which operations are stigmatized as the "opprobria of surgery." Nothing can be more unjust. Safely and expeditiously to remove parts which accident has rendered totally useless, and which would prove highly injurious if longer attached to the body; to take away diseased formations, or other noxious substances, and, at the expense of but brief suffering, to dispel torture which had rendered existence a burden for previous weeks, months, and years; to accomplish such results, though it be by blood and suffering, is alike creditable to the operator and beneficial to the patient. It is not the operation—but the operation unseasonably, unnecessarily, unskilfully performed—that brings disgrace; and to refrain from operating when we are loudly and plainly called upon to do so, would carry not only opprobrium to surgery, but guilt and shame to the surgeon. In former times, it is true, operations were the disgrace of our art. Knives, hot irons, screws, files, gimlets, gouges, hammers, and saws were employed with cruel and ignorant recklessness. Of late years, however, every good surgeon has sought not only to simplify and diminish the number of instruments, but also to use them as seldom as possible. He does not hesitate to employ them, when his knowledge and experience intimate that they have become indispensable; on the contrary, he will then probably be urgent in their application, knowing that an early wound may save much after-suffering. But, in the first place, he will exert all his skill and all his powers, by milder measures, so to counteract injury and restrain disease, as to supersede the necessity of operating. To effect this, is doubtless the true triumph of his profession; and to this triumph he often attains. But he must be Utopian, indeed, who can seriously hope that the period will ever arrive, when operations shall have altogether ceased to be required. Modern surgery, accordingly, while anxious to limit the necessities for operation, is not the less aware of its importance as a means of cure; and has not only directed attention towards its improvement, but also extended its application, and with the happiest result, to diseases formerly without remedy. Many patients,

for example, are now by the knife freed from morbid growths and natural deficiencies, who were formerly left an unprotected prey to deformity and disease.

A prominent cause of modern improvement in the art of operating, is an increased simplicity of the instruments, their arrangement, and use. On this subject, one who was pre-eminently distinguished among the operators of the present day, observes:[1] "Our armamentaria should contain simple and efficient instruments only; the springs, grooves, notches, and curves, seeming to be chiefly intended to compensate for want of tact and manual dexterity. The apparatus, though simple, ought to be in good order, and should always be placed within easy and convenient reach of the operator, so that he may be in a great measure independent of the lookers-on; who, owing to anxiety or curiosity, hurry and agitation, are apt to hand anything but what may at the instant be required. He will consider well what place he himself may most conveniently occupy during the operation; and, having obtained proper assistants, he will make sure that they all understand what is expected of them. In short, before he ventures to begin, he will ascertain that everything is arranged, and in proper order; more particularly, that the cutting instruments have good points, that their edges are keen, and that the joints of forceps and scissors move freely and readily. The principle, too, on which the instrument is made to cut should be well considered. Every knife is to be looked upon as a fine saw; the teeth of some are set forwards, and these cut best from point to heel, as does a razor; but the greater number are set in the opposite direction—for example, the common scalpel and bistoury—and act efficiently only in being drawn from heel to point.

"The skin, and in many instances the subjacent parts, should be divided at once and completely, by a single incision made lightly and rapidly—the parts being placed in a state of tension by the fingers of the surgeon or of an assistant—for the pain experienced is in proportion to the pressure and tardiness of movement in the instrument applied. Partial division of the skin, in tails left at each end of an incision, is also to be avoided; for the pain of such a cut is unnecessarily severe; and, besides, such wounds are not so available, as they would otherwise be, for the intended purpose of evacuating fluid, for permitting the extraction of foreign bodies, or for the dissection of morbid growths. Also, the pausing of a surgeon in the midst of a dissection, and the resort to fresh and more extensive incisions of the surface, is not only always awkward, but attended with additional and unnecessary pain to the patient. Every cutting instrument should be well balanced, and placed in a steady, smooth handle; the point should either be in a line with the back, which ought then to be perfectly straight, or both edge and back should be equally convex, with the point corresponding to the middle of the blade.

"The form and size of the instrument ought always to be in proportion to the extent of the proposed incisions, as regards both their length and their depth; nothing can be imagined more cruel and reprehensible,

[1] Liston, Operative Surgery.

for example, than an attempt to remove the lower extremity of a full-grown person with a common scalpel, or dissecting-knife. If an extensive incision is necessary, an instrument should be employed possessing length of edge sufficient to separate the parts smoothly and quickly. Should the operator, on the contrary, be required to cut on important parts—to perform a delicate dissection of the living tissues—he will choose a short-bladed instrument, with a handle rather long and well rounded; and, after the superficial incisions have been effected, he will hold it as he would a writing-pen, lightly but firmly, so that he can turn the edge, and cut either towards or from himself, as occasion may require. A small well-made scalpel, with a good point, and less convexity than those usually employed, is the instrument best adapted for such a purpose. Grooved probes and directors should be used as little as possible. With a little practice, incisions may be made upon the most delicate parts without risk, one layer being cut after the other. And if any instrument is wanted to make the proceeding more safe—if the closely investing fasciæ of a hernial tumor, for example, are to be cautiously raised—dissecting-forceps will be found the most convenient instrument for elevation previous to incision.

"In dividing the skin, the knife, whether a scalpel or a bistoury, is to be held and entered with the point and blade at right angles to the surface. It is carried with a decided movement down to the subcutaneous cellular tissue; the blade is then inclined towards the part to be divided, and by a rapid and slightly sawing motion—as little pressure being applied as possible—division is effected to the desired extent. The incision is finished by withdrawing the knife in a position perpendicular to the surface, so as to divide the entire thickness of the skin, at the extremity as well as at the origin of the wound. For dexterously effecting such manipulations, the fingers must be educated; and diligent practice in the dissecting-room will be found the best foundation for surgical dexterity, as it is for sound surgical knowledge; it is only when we have acquired dexterity on the dead subject that we can be justified in interfering with the living." By practice, the pupil will be enabled to use either hand almost equally well; and none should neglect to attain this power—for an ambidextrous surgeon possesses great advantages as an operator.[1]

An ordinary degree of expertness is within the reach of any one who will industriously seek for and improve the opportunities for its acquirement; but yet a certain combination of natural qualifications is undoubtedly necessary to the attainment of pre-eminence in operative surgery; a great operator in one respect resembling a great poet—*nascitur, non fit.* The importance of these natural gifts did not escape Celsus. "He must be young, or at most but middle-aged," says he, "and have a strong steady hand, never subject to tremble. He must be ambidextrous, and of a quick, clear sight. He must be bold; and so far void of pity that he may have in view only the cure of him whom he has taken in hand; and not, in compassion to cries, either make more haste than the case

[1] The making of wounds, with a view to the promotion of their cure, has been already considered. (*Principles*, 3d Am. Ed. p. 605.)

requires, or cut less than is necessary, but do all as if he were not moved by the shrieks of his patient." The coolness and courage thus inculcated are among the most valuable natural gifts of the surgeon; and it would be well did every patient remember that they are equally important in himself, for on his steadiness and patience under suffering much of the celerity and success of an operation may sometimes depend.

In the present day, however, the operator is much less dependent on his patient than he was wont to be; in the great majority of cases the latter being absolutely passive in his hands, because quietly recumbent under the influence of complete anæsthesia. The obtaining of such quietude and non-resistance, the abolition of pain, the mitigation of shock, and various other advantages affecting both operator and patient, from the judicious use of chloroform, have been already fully considered,[1] and on that subject it is not necessary again to enlarge.

The necessity for an operation, in any case, having been clearly established, our object is to perform it as safely and expeditiously as possible. The mere absence of protracted pain confers a most important advantage on the reparative powers of the system; and, so far, celerity is commendable, when chloroform is not employed. But it is a very common, as well as dangerous error, to suppose that excellence is always commensurate with the rapidity of performance. In the great majority of cases, haste is incompatible with safety; while the latter is the paramount object in view. *Tuto et celeriter* is the operator's motto; but the *tuto* precedes its accompaniment. And now, more than ever, as has already been stated (*Principles*, 3d Am. Ed. p. 722), haste and hurry are altogether inexcusable. The student, as an operator, should learn to be rapid; but rapid, because skilful; and rapid only when safe. And, in some procedures, he will not fail to learn that attempted rapidity must ever prove injurious.

Perhaps a more common, and still more serious error is—the imagining that operations constitute the greater and more important part of Practical Surgery. The student is very apt to be led away by the more garish and imposing parts of his profession, to the neglect of that which is in truth by much the more valuable; and he may also forget that, in after life, he will be only occasionally called upon to perform the greater operations, while daily he must exert his general knowledge and skill, as well as his minor handicraft, to avert the necessity for the knife's employment. In the case of a diseased joint, for example, he is not at once to contemplate amputation or resection. Such procedure is the ultimatum, not the initiative of his art. Local depletion, rest, counter-irritation duly timed and conducted, pressure, splints, attention to the general health (*Principles*, 3d Am. Ed. p. 484), these—to some apparently a simpler, but in truth a far higher adaptation of knowledge—conspire, and often with success, not to mutilate the frame and endanger life, but to save both life and limb, at little or no cost of either pain or danger. Again, in the torturing complaint of stone in the bladder, it is doubtless a great matter to be able, by a speedy operation—severe, and perilous to life though it be—to free the patient from his misery. And the accom-

[1] Principles of Surgery, Appendix, 3d Am. Ed. p. 699, &c.

plished surgeon must be at all times competent to undertake fearlessly this hazardous procedure. But it is surely a higher exercise of a better skill, and both the means and the result will prove infinitely more creditable and satisfactory, if, by the internal use of simple remedies, and suitable attention to hygiene, the disease shall be in its very origin frustrated, pain and danger dispelled, and health and comfort restored—all without the infliction of a scratch, or the loss of one drop of blood. In the case of injury, too, the paramount importance of general treatment will be found equally to obtain. The surgeon is ready, at a moment's warning, to amputate skilfully a crushed limb, which has obviously no chance of retaining its vitality, and which, if not speedily removed, must inevitably peril the whole frame's existence; and when, by such severe operation, he succeeds in averting the greater calamity, he has most just ground for self-gratulation, and may truly say that a good thing has been done by his art for suffering humanity. But when, in the case of an injury, a shade less severe, there is a doubt whether or not the limb may be enabled to resist the threatened gangrene; when he hesitates not to give to his patient the benefit of that doubt; when, by great patience, care, and skill, he arranges the mangled fragments in their proper place, retains them so by suitable apparatus, affording due support, and yet permitting no undue pressure, regulating the play of the general circulation, controlling the efforts of the *vis vitæ*—in short, averting both local and general disaster, and bringing the healthful action of reparation to complete, though it may be slowly, its valued process of cure; and when ultimately a thorough and permanent success crowns such patient and anxious labors, surely the cause for self-gratulation is increased a hundred fold; the surgeon may well say that a far better thing has been done by his art; and the discerning public will not fail to award a higher and truer meed of praise.

The advance of surgery will ever be found characterized by a corresponding decrease of its operations, both in amount and in severity. The true object of our mission is not to cut, but to cure.

See on this subject, John Bell's large Treatise on Surgery; and the various modern works on Operative Surgery, more especially those of Liston, Fergusson, and Skey.

CHAPTER II.

INJURIES OF THE SCALP.

Bruise of the Scalp.

THE scalp is especially liable to severity of contusion. It is a part much exposed to external injury; it is stretched over dense resisting bone; it is possessed of very considerable vascularity; and its arterial branches, being neither inactive nor minute, are apt to part with blood freely when torn. Hence, when external violence is applied, the higher results of contusion are very apt to follow (*Principles*, 3d Am. Ed. p. 690). The integument may give way; causing a contused wound, of greater or less extent, whose margins will slough and separate, and which will not heal without considerable suppuration, and a corresponding amount of attendant inflammatory action. Or, the skin, at first unbroken, may slough to a greater or less extent; either immediately, from the direct effect of violent contusion; or secondarily, by inflammation induced in a part whose vitality had been only lowered by the bruise, not annihilated. Or, the integuments remaining entire, blood is copiously extravasated from ruptured vessels; breaking up the areolar tissue, and producing a large fluctuating tumor—sometimes forming rapidly, with tension of the skin, and much pain in the part. Or, subsequently to sanguineous infiltration, inflammatory action may be lighted up in the implicated texture; inducing suppuration of an unhealthy kind, with a considerable amount of constitutional disturbance, and with a risk of the latter being unfavorably affected by the suppuration assuming the asthenic, diffuse, and infiltrating character (*Principles*, 3d Am. Ed. p. 222). The danger of such occurrences must be remembered in the prognosis.

But the ordinary result of bruise, in this locality, is the formation of a bloody tumor; blood escaping more or less freely from torn vessels, and accumulating in the part; while room is made for its reception, partly by disruption of texture, partly by that which remains entire being pushed aside and condensed. As already stated, the integument is tense or not, according to the rapidity and amount of extravasation. At first, the indications by touch are uniform throughout the whole swelling, all the blood being as yet fluid; and uniform fluctuation is more or less distinct, with elasticity. Soon, however, the blood in part assumes the solid form; and then the characters of the tumor change. At the circumference, there is a hard, resisting ring, more or less elevated, composed of coagulum. In the centre, the part is soft, yielding, fluctuating; the extravasation there remaining fluid consisting chiefly of serum, and situated immediately beneath the in-

tegument. The clot occupies the margins. At this period care is required in examination, lest a false diagnosis be arrived at. The finger, placed firmly on the centre, readily displaces the serous fluid, and may seem to penetrate to some depth; while similar pressure, made at the margins, meets with hard, unyielding resistance—and that at a considerably higher level than had just been passed by the finger in pursuit of the retreating serum. The careless observer of such things is apt to imagine them undoubted indications of fracture, with depression, having occurred in the cranium; supposing the hard ring to be the bone in its normal position, with an abrupt broken margin, beneath which a detached portion has been driven down. Attention to three or four circumstances, however, will suffice to undeceive. The symptoms of depressed cranium do not exist. Press firmly on the soft and yielding centre; the subjacent bone will be reached by displacement of the intervening fluid blood, and will be found firm. The hard rim of the swelling will be found on a higher level than the general calvarium; and, besides, by a little firmness of manipulation, if such be deemed necessary, the clot can be displaced somewhat, leaving firm bone beneath.

The treatment of such a bruise is conducted on the principles generally applicable to this description of injury (*Principles*, 3d Am. Ed. p. 691). In certain situations—as directly over known branches of the temporal or occipital arteries—swelling may be in a great measure prevented, by moderate pressure being steadily maintained on the cardiac aspect of the implicated vessel; and this indication may be farther fulfilled by continuous application of cold to the part and its immediate vicinity. When the tumor has formed, even tension will not warrant either puncture or incision; for the admission of atmospheric influence to the extravasated blood and infiltrated tissue, is likely to induce inflammatory action under very unfavorable circumstances. By fomentation rather—associated, if need be, with restraining pressure on the arterial branch—let accommodation be obtained for the escaped fluid by a yielding of the recipient texture; ward off inflammation by general antiphlogistics; and await the disappearance of swelling, gradual and tedious though it be, by the natural action of absorption. The fluid portion of the extravasation is taken up first; the coagulum follows, more tardily.

But if inflammatory action shall have occurred, and suppuration formed, free and direct incision must not be withheld. By no other means can diffuse suppuration be prevented, and constitutional disorder checked. At once lay the part freely open; turn out the coagulum, and permit all fluids to escape. An unhealthy abscess remains for a time, but duly changes, contracts, and heals; and the knife is not again required. But delay incision, and then the knife is called for, not merely in the bruised part, but in the parts adjacent, now the seat of a spreading asthenic inflammation, and in imminent danger of perishing thereby. The asthenic tendency, as formerly hinted, is probably owing to the bruise having lowered the vitality of the parts, so impairing their tolerance of inflammatory action.

Constitutional management is not to be neglected. It is obviously of great importance to avert, or at least to moderate, the accession of an

inflammatory process in the injured part. On this ground alone, rest and quietude, antiphlogistic regimen, and perhaps depletion, are expedient. But the necessity for recourse to such precautions becomes still more apparent, when it is remembered that the brain, in all cases of severe bruise of the scalp, must have suffered more or less by concussion, and has to be protected from the consequences.

When all risk of inflammatory accession has passed, and swelling has not yet disappeared, absorption may be hastened by discutient measures. The part may be kept wet with a solution of the muriate of ammonia, or with a weak dilution in water of the tincture of arnica; afterwards friction may be used, and, if need be, pressure.

Bloody tumors, of the foregoing nature, not unfrequently form on the presenting parts of the heads of children newly-born; especially if the labor have been tedious, or the pains very violent.[1]

[The subject of *cephalhæmatoma* has, of late years, attracted considerable attention in Germany and France; and many interesting facts have been elicited concerning it. One of the latest and most authoritative writers on this affection is M. Valleix; and in his essay, published in his *Clinique des Maladies des Enfants*, Paris, 1838, will be found an excellent and comprehensive exposition thereof, accompanied with colored drawings.

The collection of blood may be *subaponeurotic*, *subpericranial*, or *submeningeal*. The first-mentioned form is very rare; M. Valleix met with but two instances of it in 500 new-born infants, whose heads he carefully examined with reference to its existence. It is almost uniformly occasioned by very considerable violence during birth. It presents, in its phenomena and treatment, nothing different from similar injuries occurring in adults.

The *submeningeal* variety of cephalhæmatoma is, probably, even more infrequent than that just spoken of.

The *subpericranial* effusion cannot be regarded as a frequent accident, though it is more often seen than the other forms. Nægele observed but 17 cases in the course of twenty years' practice; Dubois met with but 6 cases at the *Maternité*, during several years, although the number of births at that institution amounted yearly to between 2,500 and 3,000; M. Valleix witnessed 4 cases in 1,937 new-born infants received at the *Enfants-Trouvés*. According to the last-named authority, the proportion of instances of the kind may be estimated at about 1 in 500 births. Ordinarily, there is but one such collection in any single head, and this occurs most frequently about the postero-superior angle of the *parietal bone* of the *right* side; in rare instances, it is on the occipital or frontal. The effusion rarely transgresses the sutures, being prevented from so doing by the firm union which exists

[1] This affection is designated by obstetricians *Cephalhæmatoma;* while simple bloody infiltration of the presenting part of the scalp is termed the *caput succedaneum*. In the commonest form of Cephalhæmatoma, the subpericranial, the tumor becomes surrounded at the base by an osseous ring, and the pericranium, too, is sometimes the seat of osseous deposit, so as to be felt crackling over the contained blood. This blood disappearing, the ossified pericranium approaches the bone, and unites with its rough and bare surface, causing slight thickening of the bone at that part.

between the pericranium and the bone at these lines. The size of the tumor varies from that of a small nut to that of an entire parietal bone; when seated upon the parietal, its form is usually oval; when upon the occipital or frontal, it is more globular.

The tumor forms gradually in from a few hours to one or two days; at the end of which time it has attained its greatest volume. It is now somewhat tense and elastic, and yields, upon proper manipulation, a more or less evident sense of fluctuation. The integuments covering it are, in general, not at all altered in appearance; there is no œdema, ecchymosis, or alteration of color. The base of the tumor is, if examined at the end of a few days, or sometimes earlier, surrounded by a firm resisting elevation, or rim, of bony matter. The existence of this raised and resisting margin might, if imperfectly examined, lead to the impression that the cranium is deficient within its circle, and that the case is one of congenital hernia of the brain. But firm pressure made upon the tumor reveals the presence beneath it of the bone, particularly, as M. Valleix insists, if the pressure be made from the marginal osseous ring towards the centre of the tumor. Moreover, this pressure produces no disturbance of the functions of the brain, nor does it diminish the size of the tumor; neither can any pulsation be felt in the latter, the cases in which this phenomenon has been stated to have existed having been probably hastily examined.

If left to itself, or if palliative treatment alone be attempted, the tumor sometimes diminishes in size, but never completely disappears; the contained blood may undergo some disorganizing change, or inflammation and suppuration may occur, endangering caries or necrosis of the bone, with fatal brain affection, or a process of ossification may obliterate the cavity of the tumor, leaving a corresponding elevation upon the surface of the bone.

Post-mortem examination of the tumor, or inspection of it during life, after incision, reveals the following appearances: The scalp and the occipito-frontal aponeurosis present no alteration, unless inflammation may have been induced; the pericranium is found transparent, but somewhat thickened, generally smooth and polished on its inferior surface, though in rare instances, perhaps, dotted with cretaceous deposits, or partially ossified; its attachment to the osseous ring, before mentioned, is uniformly firm, and beyond this line its inferior surface exhibits, in its filamentous and shaggy appearance, a striking contrast to the polished aspect which it presents within this bony circle. In the cases examined by M. Valleix, a more or less perfect false membrane was found lining the cavity of the tumor, in contact on one side with the cranium, and, on the other, with the inferior surface of the pericranium, and constituting a closed sac, within which was the effused blood. This membrane was sometimes filamentous, sometimes flocculent; in one instance cartilaginous; it has been seen containing cretaceous matter. It is, probably, a plastic exudation, intended partly to protect the bone with which the blood would otherwise be in immediate contact, and partly, also, to constitute an early stage of a subsequent process of ossification. The blood contained within the tumor varies in quantity, amounting sometimes to 8 or 10 ounces; it presents, according

to the age of the tumor, all the different phases witnessed in similar collections elsewhere, from the fluid to the solid state. The surface of the bone exhibits nothing abnormal beyond a mere increased vascularity; the external table, as shown by M. Valleix, does not exist at the early age in question; the bone itself offers no evidence of disease. Occasionally, a fissure has been seen in the cranium which allowed of the passage of the blood, externally situated to the interior, between the bone and the dura mater. The circle of bone which circumscribes this variety of cephalhæmatoma, and which, according to the investigations of M. Valleix, is peculiar to this tumor, and always serves to characterize it, unless examined at a very early period, generally completely surrounds the collection of blood, being wanting only over the sutures; it is easily raised from the bone, the surface of which is little, if at all, altered from the healthy condition; in shape it is triangular, the apex presenting upwards; its consistence varies, being usually less than that of the bone upon which it grows; its height is not the same in all cases, nor at all points in the same case, varying from two lines as the maximum. Various opinions have been advanced concerning the nature of this production; it is probably, however, as M. Valleix surmises, similar in character to the *Osteophytes* of Lobstein; or it may be the result of a process of ossification occurring in the coagulum of the blood effused, or of the plastic exudation (Nélaton, *Pathologie Chirurgicale*, tom. ii. p. 616); it is undoubtedly a step towards reparation.

As to *the causes* of this curious accidental affection, much information has been gained by the investigations of M. Valleix. From these, taken in connection with prior examinations by Haller and Dubois, we learn that previous to birth, and for two weeks or more subsequently, the bones of the cranium are only partially formed, possessing at the protuberances alone an internal and an external table and an intermediate diploe, but elsewhere merely the internal table and a rudimentary diploe, which is very vascular; so that if any considerable compression be made circularly around the cranium, the blood will start out in drops upon the surface of the bones from innumerable small orifices; and if the compression be continued, the blood will collect in a layer, dissecting up still farther the pericranium, and thus favor an increase of the sanguineous exudation. Of course, the quantity of the latter present in different cases must chiefly depend upon the degree and duration of the compression exercised upon the cranium.

From these observations, M. Valleix's explanation as to the mode of formation of cephalhæmatoma becomes the most probable and rational yet advanced: that it is due to compression exercised upon the head of the child by the circular fibres of the os uteri during the process of parturition.

A tumor of this kind is much more apt to appear upon a first child, twenty-nine times out of forty-one (Burchard); and more frequently in male than in female children, in the proportion of thirty-four to nine, according to the same authority. (*Nélaton, op. cit.* p. 618.)

The *diagnosis* of this form of bloody tumor of the scalp is easily established by determining the presence of the following characteristic points: It is not situated over the sutures or fontanelles, for the rea-

sons already given; it is surrounded by a firm, bony elevation, more resisting than a mere elevation of indurated cellular tissue would be, circumscribing an abscess; and, moreover, it would probably have commenced forming more immediately after birth, and would not have been preceded by the easily recognizable symptoms of inflammation; it is destitute of pulsation; pressure upon it causes no diminution in its size, nor does it produce any evidence of compression upon the nervous mass within the cranium, because the bony covering of the latter is complete beneath the tumor, and may be felt if the examination be made in the manner before described.

In the 28th Vol. of the *Medico-Chirurgical Transactions*, Dr. West reports a case of cephalhæmatoma, in which an effusion of blood had occurred *between the skull and the dura mater*, as well as beneath the pericranium, at the usual place, and a fissure existed in the parietal bone. From all the circumstances of the case it seemed certain that the two effusions and the fissure of the bone took place at the same time and from the same cause, viz.: the pressure exercised upon the cranium during labor. The changes observed, after the death of the child, about the seat of the internal effusion, corresponded precisely with those noticed externally, and with the description which we have given above.

The *treatment* most employed and recommended by the best German and French writers, consists in making a *free incision* into the tumor, evacuating its contents, and then applying emollient dressings. In making the requisite opening, the larger vessels should be avoided in consequence of the difficulty of arresting the hemorrhage which would ensue, and the danger to the life of the little patient from any considerable loss of blood. Little weight seems to be attached by the authorities alluded to, to risk incurred from the admission of air to the interior of the tumor; reparation advances rapidly and without unfavorable symptoms. The employment of the *seton* or of *caustics*, as recommended by some surgeons and accoucheurs, is not considered advisable or safe. The use of discutient or resolvent applications is of very doubtful advantage; if they succeed at all, it is very slowly; and in many instances, after they had been fairly tried, they have been discarded, and recourse has been had to incision, in consequence of the supervention of suppuration and bad constitutional symptoms. However, we think that most English and American surgeons would prefer to employ these simpler means first, before resorting to what *seems* a harsh and dangerous operation upon so young a subject for the knife. But if unpleasant local or general symptoms should manifest themselves, the latter operation should be promptly and unhesitatingly practised.

We have made these somewhat lengthy observations partly on account of the interesting character of the affection, and partly because it is so imperfectly noticed in the usual surgical text-books.—Ed.]

Wounds of the Scalp.

Simple incised wounds of the scalp are apt to prove troublesome by bleeding. The arterial point or points are to be exposed, and secured

by ligature. Pressure may, in some instances, succeed; but, in general, it is decidedly inferior to the use of ligature; being not only less certain as a hemostatic, but also liable to induce sloughing, or at least a troublesome ulceration in the compressed part. When necessary, therefore, the surgeon need not hesitate to extend the wound, to facilitate accurate deligation. When bleeding has been arrested, the wound is to be brought together, and retained in apposition; but sutures are, if possible, to be avoided, experience having shown that here they are especially liable to prove the exciting cause of erysipelas. The subsequent management is such as is ordinarily adopted for securing adhesion (*Principles*, 3d Am. Ed. p. 593). One simple precaution should never be omitted at the commencement of the treatment; namely, the shaving of the scalp, not only at the wounded part, but to some distance around. The retentive straps, and other dressings, are then more readily and securely applied; the part is more certainly kept free from irritation; coolness is more easily maintained; and inspection of the wound's progress is more complete.

In *contused and lacerated wounds*, there is the same risk of unfavorable inflammatory action as in bruise; and this is, accordingly, to be guarded against. Very often, the wound is extensive, and irregular in form; a portion of the scalp is detached from the subjacent bone, and hangs over, an unseemly flap. Formerly, it was the custom to cut away the pendulous portion; it being considered incapable of reattachment. Now, it is invariably preserved, and carefully replaced. It seldom

Fig. 1.

Fig. 1. The Couvre-chef, a handkerchief so arranged as to cover the head, with a view to retain dressing. The handkerchief having been folded into a triangular shape, the centre of the base is placed on the middle of the forehead, the body of the handkerchief covering the head, and the apex or corner hanging down the neck. The two long ends, previously lying on the cheeks, are crossed beneath the occiput, covering "the apex or corner," and are brought forward and tied on the forehead. The handkerchief is then smoothed by pulling "the apex or corner," which is turned over the crossed "ends," and secured. (After Lonsdale.) *Lancet*, No. 1417, p. 470.

Fig. 2.

Fig. 2. A double-headed Roller, applied so as to cover the head, making equable pressure on every point. The centre of the roller is placed low down on the forehead, and the two heads are carried back and made to cross low down beneath the occiput. One head is then brought over the vertex, while the other is carried horizontally round to lap its extremity; and this, turned up over the horizontal one, is carried back to the occiput, slightly overlapping the former vertical band. At the occiput, the heads are again crossed (the surgeon shifting hands), and a third turn is made on the other side of the vertical band, while a third horizontal round secures it as before. And this is continued until the whole head has been uniformly invested. (After Lonsdale.)

sloughs, even in part. Equally seldom, however, will it unite at once by adhesion. It suppurates, granulates, and becomes slowly, yet firmly and satisfactorily rejoined to the subjacent parts. When a congested and flabby state of the flap occurs, as often happens, during the suppuration, support by carefully applied bandaging is highly expedient.

For retaining dressings, and affording gentle support to the scalp, a common handkerchief may be applied, as in Fig. 1.

But when direct, accurate, and considerable pressure is required, the double-headed roller is preferable, as in Fig. 2.

For retaining dressings on any particular part of the head, the four-tailed bandage is often very useful, as in Fig. 3.

Not unfrequently, the bone is rudely denuded of all its soft investments; as in heavy falls, when the head comes violently in contact with stone. The pericranium is rubbed off, and the bone is not only wholly exposed, but roughened in its own texture. In such cases, we are not to refrain from readjusting the soft parts, in the belief that exfoliation must necessarily ensue, and that a patent condition of the wound is consequently to be desired. Many bones thus circumstanced recover entirely. They may, for a day or two, become white and dry on their mere surface, as if undergoing necrosis there; yet, it is by no means unusual, when such necrosis is not favored by the treatment employed, to find this dry bone revive, becoming vascular, brown, and exhalant, as before, and, in due time, contributing its quota to the general process of reparation. Should inflammation supervene, and advance to suppuration, either in the limited or in the diffuse form, early incision is demanded; in the one case, to evacuate pus, and prevent accumulation; in the other, to limit its formation, and prevent infiltration. When the areolar tissue beneath the occipito-frontalis expansion is implicated in the latter event, incision is required to be especially early and free; not only to avert destruction to texture, but also to prevent, or moderate, implication of the all-important cranial contents. These, indeed, must be duly regarded, throughout the whole period of treatment, as in simple contusion (p. 24).

Fig. 3.

The four-tailed Bandage: of use in retaining dressings on any particular part of the head. A piece of cloth split at either end; the central unsplit portion placed on the dressing. The two posterior ends secured below the chin; the two anterior ends, overlapping these, cross at the occiput, and are also secured below the chin.

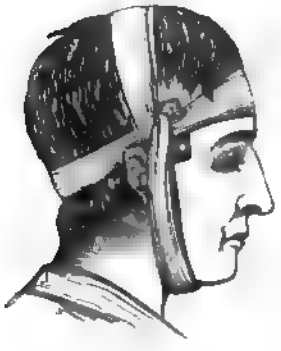
Punctured wounds of the scalp, usually oblique and penetrating, are always important; being very apt to be followed by severe inflammatory action; and at an early period, and on this account, demanding incision. As a general rule, it may be stated that inflammatory action in the scalp must always be treated with great activity. First, because

the textures are unfavorable for safe advancement of the process; they are vascular, tense, unyielding, fibrous; the action is apt to be acute; the exudation is copious and rapid, accommodation afforded by the recipient texture is insufficient, tension ensues, and, as usual, aggravation follows thereon; suppuration is speedy, and apt to be diffuse; and the pus tends to burrow rapidly, and in all respects destructively, beneath the fibrous structures. Secondly, the part affected is in close and dangerous proximity to the cranial contents; and these are apt to be involved in a secondary, but not less important, inflammatory process.

Wounds of the Temporal Artery.

Arteriotomy.—Under certain circumstances it is deemed advisable to abstract blood, with a remedial object in view, from an artery, and from one situate in the upper part of the body. The anterior branch of the temporal artery is usually selected. Being quite subcutaneous, it is of easy access; and being also placed immediately over resisting bone, it is favorably situated for hemostatic purposes. A suitable part of the vessel having been fixed upon, it is steadied by the fingers of the left hand, while a lancet, moved by those of the right, is made to perforate the arterial tube, in an obliquely transverse direction. The entrance and exit of the lancet are managed so as to make the wound of the integument considerably larger than that in the arterial coats, in order that there may be no obstruction to the free escape of blood. A section of the wound, in fact, should resemble that of a cone; the truncated apex corresponding to the aperture in the vessel, the base to that in the integument. When a sufficiency of blood has flowed, it is well to reintroduce the lancet, and to move its point so as to effect complete section of the vessel, in order that contraction and retraction of each orifice may take place, and natural hemostatics may so be favored (*Principles*, 3d Am. Ed. p. 336). A graduated compress is accurately applied over the wound, and securely retained by a bandage. The dressing should not be disturbed for several days.

Fig. 4.



Compress applied to the temporal artery, after arteriotomy.

If blood do not escape readily enough, a cupping-glass should be applied; care being taken to raise the rim gently over the artery on its cardiac aspect, otherwise the pressure must inevitably arrest the flow. And this is the only mode of cupping which can be considered warrantable in this situation. Use of the ordinary scarificator here leaves a very unseemly scar, especially in the female. The lancet's puncture in arteriotomy is, on the contrary, slight, and its scar scarcely appreciable; and, at the same time, it is to be remembered that from this one puncture blood will flow much more freely than from all the twelve incisions of the ordinary instrument.

In accidental wounds of the temporal artery, deligation is generally

preferable to pressure, as already stated. In the case of a mere branch, it may be sufficient to tie the cardiac orifice. But when the main trunk is implicated, the distal orifice must also be secured, otherwise recurrence of hemorrhage is almost certain (*Principles*, 3d Am. Ed. p. 349).

[It occasionally happens that the temporal artery is opened, by wound or otherwise, deep in the temporal fossa. In such cases the ordinary means of arresting hemorrhage, by pressure, the employment of styptics, &c., fail; nor are the cut extremities of the vessel accessible to ligature. Mr. Mayo proposed that, in such an emergency, a ligature should be applied around the two branches of the primitive carotid; around the external to arrest the bleeding directly, and around the internal in order to prevent any entrance of blood to the temporal artery from communicating vessels either of the same or of the opposite side. M. Bérard has suggested an easier operation, viz., to tie only the external carotid; or to expose the bifurcating extremity of the common carotid, apply a ligature around this, and another around either branch.

But, unfortunately, not much reliance can be placed upon the ligature under such unfavorable circumstances; the anastomosis between the vessels of the two sides of the cranium is so free, that it is very probable the hemorrhage would recur, even after ligation of these main trunks.—Ed.]

Unpleasant consequences sometimes follow wounds of the temporal artery, whether accidental or intended. *False aneurism* may form. This, usually, has attained to but a small size, ere the patient's attention is arrested by it, and the surgeon's aid sought. If deligation be practised at a distance, it is necessary to secure the vessel on each aspect of the tumor; otherwise collateral circulation may prove too free for due completion of the cure; and, on the distal aspect, the vessel is not likely to be discovered without much difficulty. In the majority of cases, it is sufficient to put in force the ordinary treatment for recent false aneurism; to cut through the tumor, turn out the clot, and secure the vessel by ligature above and below the wounded point (*Principles*, 3d Am. Ed. p. 557). In those cases to which such procedure may seem inapplicable, ablation of the small swelling, by two elliptical incisions, may be had recourse to; securing each of the bleeding points in the ordinary way, and bringing the wound together for adhesion.

On removing the compress, after arteriotomy, the wound may be found to have degenerated into *ulcer*. The ulceration spreads, the vessel is opened, hemorrhage occurs; and, by repetition, the loss of blood becomes hazardous. Pressure, reapplied, may temporarily arrest the flow; but necessarily favors the advance of ulceration, and so renders return of the bleeding certain, on removal or change of the dressing. It is better to abstain from pressure, and to tie the artery on each aspect of the sore, either by regular dissection in the line of the vessel, or, when swelling and condensation of texture render that difficult, by transverse wounds—securing the bleeding points by forceps in the ordinary way. Or, if the ulcer be minute, ablation of the changed part may be effected, as for false aneurism.

In connection with this Chapter, consult the ordinary authorities in Systematic Surgery.

CHAPTER III.

INJURIES OF THE CRANIUM, AND THEIR CONSEQUENCES.

By external violence the cranium may be shaken, fissured, or fractured with comminution. In any case, more or less injury is at the same time sustained by the cranial contents. The brain and its investing membranes may be torn, and blood may become extravasated. The inflammatory process may be kindled, perilling life by exudation, suppuration, or chronic change of structure. Or the brain may be merely shaken, and temporarily impaired in its function.

Concussion of the Brain.

In strict acceptation, this term denotes a mere shaking of the organ; without any appreciable lesion of structure, and consequent escape of blood, immediate or secondary. Function is impaired, often most seriously; usually, it is after a time restored, more or less completely; yet not without much risk of an inflammatory process intervening, in either the brain or its membranes, to modify, protract, or prevent the fortunate issue. Under the impulse of a blow or fall, the brain must sustain more or less vibration, if the cranium remain entire. It is "a pulpy organ, which exactly fills a nearly spherical bony cavity, whose parietes are elastic in a considerable though very variable degree; and if these parietes sustain any sudden change of shape, their contents must sustain a corresponding amount of compression. As any alteration in the shape of a spherical cavity must lessen its capacity, whenever any external force impinges on the cranium with sufficient violence, it must be flattened at the point of impact, and expanded in some opposite direction; but these changes are, in virtue of the very cause whence they originate, of but momentary duration; the point primarily flattened by the compressing force immediately resumes its original shape, which is necessarily followed by a corresponding return of the expanded portion of the cranium to its previous dimensions. These oscillations may occur several times in rapid succession, their number and extent depending on the elasticity of the cranium, and on the amount and direction of the force applied. In concussion, then, the entire brain sustains a series of vibrations and momentary compressions, varying in number and amount in every imaginable degree in different cases."[1]

[1] British and Foreign Medical Review, No. 29, p. 163. See also M. Gama's Experiments on this subject. Traité des Plaies de Tête, p. 101.

The force may be applied either directly or indirectly; the cranium may be the part struck; or the patient, alighting on his feet or nates, may have concussion conveyed to the calvarium through the spinal column.

This vibration of the brain, with disturbance of its circulation, and perhaps temporary condensation of its substance, is attended with symptoms of marked disorder in the organ's functions. Sensation, mental power, and voluntary motion are more or less disturbed; and a depressing effect is exerted on the general circulation. The patient, stunned, and more or less insensible, lies motionless, pale, and cold. Insensibility, however, after a time, is found not to be complete except in extreme cases; by loud calling, monosyllabic acknowledgment may be obtained; by pinching the skin, or otherwise causing pain, some evidence is usually given of pain being felt, and an attempt is made by the patient to move the part from the supposed source of injury. Power of motion is depressed and latent, not destroyed; and the voluntary muscles, though relaxed, are not truly paralyzed. Respiration is feeble, slow, and sighing. The pulse is rapid, small, and fluttering; and especially weak at the extremities. The pupils are usually contracted, and insensible to light; but their state is variable; sometimes one is contracted, while the other is either natural or dilated. Squinting is not uncommon. Vomiting is often present; rather of favorable portent than otherwise, premonitory of recovery from this state of depression.

The patient becomes more easily aroused; and responds more distinctly to interrogation, either by words or by gesture. Respiration becomes more full and composed. The pulse is less frequent, and more distinct; but, at this time, the circulation is peculiarly irritable, the mere effort of change of posture usually inducing marked increase in the frequency of the heart's action—or even syncope. Pain now is more felt by the patient; and is referred to the head. Vomiting may continue. The returning mental power is apt to prove errant and deceptive.

Not unfrequently, a state resembling somnambulism continues for some hours during the transition to recovery. Motion, sensation, some of the special senses, and much of mental power, seem to be restored, yet the patient remains as if in a deep sleep. He may rise, wash, shave, dress, perambulate; all the while unconscious.

But reaction seldom stops at mere restoration of the normal state; the boundary of health is crossed, in an opposite direction. Reaction proves excessive; and symptoms are evinced of an inflammatory process begun in the injured part—the brain, its membranes, or both. The pulse becomes full and hard; the skin hot and dry; the face flushed; the eyes bloodshot; the pupils more contracted and insensible to light. Pain, great and increasing, is complained of in the head; restlessness is more and more marked; the mind, which may have in great measure recovered, again loses its healthful balance; delirium supervenes; and so the symptoms advance. Resolution may occur. Or effusion accumulates; coma is induced; and the issue may be fatal.

Practically, concussion may be divided into three stages. 1. Depression; marked by insensibility, and feeble circulation. This may be intense and enduring; proving fatal, and that speedily—the patient

quite unconscious throughout. 2. Reaction. The symptoms of depression pass off; circulation is restored; and cerebral function returns. In the slighter examples of injury, there may be no farther progress made untowardly. Reaction does not prove excessive. The head is confused and giddy for a day or two; but the pulse remains quiet; and, within a few days more, all has passed off in safety. 3. Excessive reaction. The inflammatory symptoms set in, and a state opposite to that of depression is established; all is excitement and perversion, both in the general circulation, and in the functions of the brain; and life is brought into imminent jeopardy, by phrenitis, or meningitis, and by proportionate inflammatory fever.

[The precise anatomical lesion of the brain, if there be any such, occasioned by "*concussion*," or productive of its ordinary symptoms, is a matter of great interest, and, in a therapeutical point of view, of considerable importance. The testimony upon this subject is vague and contradictory; most writers testify that no alteration of structure is to be detected; others, on the contrary, have detailed certain remarkable changes. This discrepancy is attributable in some degree to the fact that, in many of the few accurately reported *post-mortem* examinations which have been published, the immediate effects of the concussion have been blended with those of subsequent reaction and inflammation, or with those of more severe injuries which the organ has at the same time suffered. But in certain instances of pure concussion, even when no appreciable lesion existed—appreciable to our unaided senses—it by no means follows as a necessary consequence that no change of structure has actually occurred. Sir Benjamin Brodie has observed (*Medico-Chirurgical Transactions*, vol. xiv. p. 337): "If we consider that the ultimate structure of the brain is on so minute a scale that our senses are incapable of detecting it, it is evident that there may be changes and alterations of structure, which our senses are incapable of detecting also." Microscopic investigations may yet throw some light on this obscure question.

The carefully recorded cases of examination of the brain after concussion are as yet too few to enable us to draw any very definite conclusions from them. Mr. Guthrie has collected probably most of those that were published before the date of his work "On Injuries of the Head," (pp. 7–10.) The first which he cites is that of Littré. A young criminal, who had been condemned to die upon the wheel, committed suicide by rushing across his dungeon, about fifteen feet, and dashing his head against the wall; he fell dead instantly (*roide-mort*); no contusion was observable upon the scalp, or beneath it, and the only alteration produced in the bones of the cranium consisted in a separation of about one-third of a line of the squamous portion of the right temporal bone from the parietal, and this separation continued at some points to the depth of two lines, at others of a line or more; and on opening the skull, the only departures from the normal condition of its contents, seemed to be an increased compactness and firmness of the structure of the brain, cerebellum, and medulla oblongata, and a diminution of bulk of these parts, so that they no longer filled the cavity of the cranium as completely as is usually the case. Littré attributed this decrease in bulk

to the violence of the shock, and to the want of elasticity of the brain; and the suddenness of death to the immediate cessation of the distribution of nervous influence.'

Sabatier, after noticing the case related by Littré, says: "I saw the same thing in a person who died suddenly from a blow on the head. The brain did not fill the cavity of the cranium, and a vacant space could be seen between the brain and the inside of the bones of the head."—(*Guthrie*, p. 8.)

It is stated in the excellent *Compendium of Surgery* of Desnonvilliers, Bérard, and Gosselin (tom. ii. p. 606), that another similar instance is reported without any more details, in a Thèse of the Faculty of Paris. —(*Boyn*, 1813, No. 55.)

"Richerand and Delpech, who are said to have recorded similar cases, only refer generally to the observations of those who have preceded them.

"O'Halloran, of Limerick, gives a more positive testimony on this point, and says: "The pericranium and skull were uninjured; the dura mater adhered to the latter; there was rarely any extravasation of blood, and this but slight, and out of the reach of any instrument. In a word, I could get no information, except that in those who died soon after the accident, I have *sometimes thought* the brain did not completely fill the cavity of the cranium."—(*Guthrie*, pp. 7–9.)

Dupuytren states (*Leçons Orales*), that after violent concussions of the brain, terminating in immediate death, no appearance is visible of separation, rupture, or contusion of the nervous structure; which, however, he adds, seems to have lost its consistence, and tears upon the least effort; and the brain, deprived of blood, shrinks, collapses, and tends to occupy a smaller space.

It will be noted that, in the instances hitherto cited, death followed the accident very speedily. In others, where the fatal termination was delayed, certain more unmistakable alterations have been witnessed. Many distinguished surgeons doubt the correctness of the observations made by Littré, and others concerning the lessened bulk of the brain. Mr. Guthrie says (p. 9): "Chopart believed that Littré's case was much exaggerated, in which opinion I fully coincide; and place little or no reliance on the statement made by him, and so implicitly admitted since his time. I am not willing to believe that a diminution of the size of the brain, or its subsidence from the inside of the bones of the cranium, is more than an accidental circumstance, which may or may not be dependent on the shock which takes place, although it be followed by immediate death." M. Nélaton also views these cases in the same light, and thinks that the apparent diminution in the size of the brain is deceptive, being really due to escape of the cerebro-spinal fluid during the autopsy (*op. cit.* p. 574). But, in the work of Desnonvilliers and his associates, from which we have already quoted, p. 607, we find this objection very ingeniously answered. The cerebro-spinal fluid always escapes more or less in every autopsy, and consequently, there should

[1] Littré, in l'Histoire de l'Académie Royale des Sciences, volume for 1705, p. 69. Amsterdam, 1707.

always be an apparent diminution in the volume of the brain; and, if in these particular instances of Littré, Sabatier, and others, the brain occupied less space than usual in the cranial cavity, the residuum was not a vacuum, but was filled by the cerebro-spinal fluid, which increases or diminishes according to the less or greater space occupied by the brain; an increase of the fluid proving a diminution in the bulk of the solid. The diminished volume of the latter may be supposed to be due to suspended or enfeebled circulation through the arteries, to the expulsion of blood from the veins into the sinuses, and to the centripetal compression exercised upon the fibres and molecules of the nervous structure by the concussing cause.

If death does not take place until after some hours have elapsed, the anatomical lesions, as we have said, are somewhat different; and we think that a pretty well marked gradation of local injury may be traced in different cases, bearing a considerable degree of harmony with the severity of the symptoms manifested during life, if this be protracted sufficiently to allow the patient to recover from the immediate effect of the accident.

Commencing with the instances recorded by Littré and others, as already detailed, in which the local lesion was apparently slight, and yet death ensued so promptly as to afford no time for the circulation to recover from the depression occasioned by the shock of the accident, we meet with another limited number of observations which seem to mark the earliest stage of revival. Desnonvilliers records the *post-mortem* appearances found in the brain of a young man of twenty-three years of age, who, having been arrested for the commission of a grave crime, dashed his head violently against the wall of his dungeon, as did Littré's patient. He was found immediately afterwards senseless, in which condition he remained for three quarters of an hour, when convulsive movements came on, and he died whilst preparations were being made to remove him to an hospital. At the examination, a wound was found rather more than two inches long opposite the left parietal protuberance; there was also an ecchymosis of the eyebrow and the upper eyelid of the same side. There was no trace of fracture or wound of the skull at any point; internally, there was not the least extravasation of blood, either between the bones and the dura mater, in the pia mater, or in the brain; nor was there any contusion or laceration of the nervous structure; the consistence of the latter seemed normal, and it appeared to be altered only in being speckled and dotted with blood, which also exuded more abundantly than usual when the substance of the organ was incised and gently pressed between the fingers.

In another case, a man thirty years of age fell from a considerable height upon his head; he was taken up entirely unconscious, deprived of sensibility and muscular power, and remained thus in a state of complete prostration for eight hours, when he died. The lesions in this instance were of a complicated kind; upon the left side of the head there was a comminuted fracture of the bone, with depression and laceration of the brain over a limited extent; upon the right side, and directly opposite the seat of the other injury, was a contusion of the brain, limited to its cortical portion and extending over a space of

about four inches square; there was no extravasation of blood, either upon the surface or in the substance of the brain; but the entire mass of the organ was injected with blood, and when its substance was incised the cut surface was covered with red dots. The authors state that they have met with several other cases of an analogous kind. —(*Desnonvilliers and Bérard, op. cit.* p. 606.)

Next in order come the cases described by Nélaton, the peculiar appearances of which, he says, were first pointed out by Sanson. They are found in persons who have died after having presented symptoms of concussion of the brain; the duration of the symptoms, however, is not stated. This alteration consists in minute extravasations of blood, as large as the head of the smallest-sized pins, disseminated through the substance of the brain; they are not mere drops of blood which have escaped from the cut vessels, but real clots, which may be raised up as such upon the point of a knife. They are found upon the periphery, and also towards the centre of the brain; they exist beneath the point at which the injury was received, in the vicinity, and at distant points; they are sometimes quite numerous, sometimes very few in number. And M. Nélaton has never found them unless after violence inflicted upon the cranium, excepting in cases of the "capillary apoplexy" of Cruveilhier.—(*Nélaton, op. cit.* p. 574.)

There is still another group of cases, in which the symptoms of concussion are more or less speedily succeeded by those of a more serious character, in consequence of more severe and extensive injury, as fracture of the bones with depression, compression of the brain from hemorrhagic effusion, laceration of its substance, &c. Such are the cases recorded by Dr. Bright.[1] Dr. Bright had not met with any instances identical with those described by the authors whom we have quoted; but the inferences which he draws from those which he did witness are such as are equally deducible from the others. He says, at page 410: "What is the immediate state of brain producing the symptoms of concussion? Of this we can only judge from the nature of the injury traceable when death occurs; and as that often happens without the concussion having been so severe as to prove the immediate cause of the fatal result, we have sometimes an opportunity of investigating the early appearances; and almost the only appearances which can be considered peculiar, are the minute lacerations of the brain and vessels, which occur both upon the surface and deep in the substance of the mass; and we are led to conclude, that the violence done to the brain, if it does not always go the length of producing these appearances, has at least such a tendency, and that it is this rupture of the brain, or an approach to it, with some consequent congestion in the vessels, which gives rise to the peculiar symptoms of concussion."

Dupuytren first, and systematic French writers since his time, have drawn a distinction between *concussion* and what they term *contusion* of the brain, and have associated with the latter a particular set of symptoms. It seems to us, however, that *contusion* of the brain is occasioned by the same kind of cause as *concussion*, and that the lesions

[1] Reports of Medical Cases, vol. ii. pp. 408–411.

which are stated to characterize the former are the same in kind as those which distinguish the latter, being in fact merely exaggerations of these, and accordingly indicated generally by aggravation of the same symptoms. It is asserted that in *contusion* we have from the first convulsive movements, great agitation, partial paralysis, &c., continually increasing; while *concussion* is attended with a complete absence of movement, somnolence, &c., gradually passing off. But in the first example of *concussion* which we have cited from Desnonvilliers, convulsive movements were observed almost immediately.

The lesions of the brain in concussion, as we have detailed them, afford a satisfactory reason for the plan of treatment which Mr. Miller has so admirably laid down; and they also explain why the patient should be subjected to the watchful care of the surgeon, and to a judicious regimen, for a considerable time after the reception of the injury.—Ed.]

Treatment.—This necessarily varies according to the severity of the injury and the intensity of its results; but more especially is it different at different periods of the case. In the first stage—that of depression—if we act at all, it will be with the view of favoring at least the commencement of reaction. An opposite procedure were plainly at variance with common sense; but, unfortunately, it is found to be not equally at variance with common practice. A man stunned by a blow or fall, and laboring under simple concussion, is often bled on the instant—or an attempt, at least, is made to bleed him—by the rash and thoughtless practitioner. In other words, a fresh and powerful agent of depression is exerted on the general circulation, when such depression is already great, and has probably brought life to the very verge of extinction. If blood flow from the wound in venesection, under such circumstances, perhaps life is lost; at all events, the direct untoward result of the injury is aggravated; and the case is rendered both more urgent and more protracted than it otherwise would have been. The lancet is certainly not to be used, during this stage. In many cases we should be little more than passive spectators. The depression is not extreme, nor giving indications of long continuance; signs of reaction, on the contrary, are slowly manifesting themselves; and we await the natural progress of events. Not altogether idle, however. Although not engaged in active treatment, we are prepared for activity, when circumstances shall call for our interference. The patient is stripped and put to bed. His whole body is carefully examined. He cannot tell us whether or not other parts have been injured, besides the head. Besides an anxious investigation as to the existence or not of other internal injuries (*Principles*, 3d Am. Ed. p. 106), we must ourselves carefully examine each joint and bone; detecting fracture or dislocation, and having it immediately rectified, while circumstances are all so peculiarly favorable for the required manipulations (*Principles*, 3d Am. Ed. p. 679). On recovering his senses, he has not to complain of a painful and distorted limb, now for the first time observed; but finds what was distorted duly replaced, and already some way advanced in the process of repair. The head is carefully shaved; and is placed on pillows, considerably elevated. If wound

of the scalp exists, hemorrhage is arrested, if need be; and approximation is effected in the ordinary way.

Should the depression prove great and continued, plainly indicating risk to life by syncope, something more is required of the practitioner. He endeavors gently to originate reaction. Warmth is applied to the surface, and friction is used over the chest and abdomen. If this be not sufficient to turn the course of the symptoms, a stimulant enema of turpentine is given. If still the progress be downwards, an attempt is made to convey to the stomach some warm tea, or soup, or wine and water; and stimulants are held to the nostrils for insufflation. These last, however, are always to be warily managed, so as to avoid risk of injury by their too free application to a patient at the time insensible of pain; and the giving of fluids by the mouth, too, must be effected with care, lest they pass into the air-passages, and produce asphyxia. So soon as reaction has begun, we cease from our auxiliary efforts, and again become passive onlookers; completion of the second stage being always safest in the hands of nature.

If stimulants are used at all internally, it must be only in urgent circumstances, and with much caution; begun with a sparing hand, and repeated warily. And, in general, we are well content to do nothing in this way, knowing that moderate depression is a favorable occurrence, and that premature cessation of it, especially when followed by abrupt and marked reaction, is apt to prove most injurious; for, at first, we can never be certain that the case is one of pure concussion. There may be a lesion by laceration of the brain's substance. During the existence of concussion's first stage, the case remains, practically, one of concussion still; circulation is weak in the torn part as elsewhere; extravasation of blood does not take place from the open vessels; valuable opportunity is afforded for their closure by natural hemostatics; and, when at last, it may be after some hours, the natural reaction slowly sets in, and circulation is proportionately restored, still no escape of blood occurs, and the symptoms may remain those of mere concussion to the last. Whereas, had the period of depression been abridged, and reaction rendered not only premature, but also abrupt and active, circulation would have been restored in the injured part ere the open vessels had closed, blood would have been extravasated, and compression of the brain must have ensued; or, even if no lesion of the brain have occurred, the case being, in all respects, one of mere concussion, still premature and excessive reaction is most hazardous, by tending not only to kindle an inflammatory process in the brain or its membranes, but also to secure its being of an aggravated, and, perhaps, uncontrollable character.

Thus, then, it is plain that two great errors may be committed in the treatment of the first stage of concussion. Blood may be drawn prematurely; lowering the vital powers still farther unnecessarily, untowardly, perhaps fatally. Or stimuli may be imprudently employed too soon and too freely, hurrying on reaction, and endangering life, either by compression, in consequence of extravasation of blood, or by an inflammatory process of an urgent and untoward character. Let both errors be studiously avoided, for each is of a most grave nature. While we

take care that the depression does not proceed too far, let us beware of doing anything to effect either a premature or an excessive reaction; and, when we attempt to fulfil the former indication, let us beware both of inducing asphyxia, by the misconducting of ingesta; and of causing troublesome excoriation and subsequent inflammation in susceptible and important parts, by the spilling of irritant stimuli upon them.

In the second stage, while reaction is in progress, we have still either hand ready, to favor, or to repress, yet very often find it prudent to abstain from active interference; leaving the task, almost entirely, in the more skilful and competent hands of nature. We content ourselves with carefully excluding all source of excitement, either to the general circulation or to the brain's function—more especially light and noise; and cold is continuously applied to the shaven scalp, by wetted cloths, or by evaporating lotions. Such treatment is not calculated either to thwart or to prevent the normal amount and form of reaction; while, at the same time, it leans to the side of repression sufficiently to guard against the excess of reaction, which, not improbably, is speedily to threaten.

It may happen that, though the reactive effort is well begun, it ceases, flags, and retrogrades; a period of depression again sets in, and this relapse looks more formidable than did the first effect of the injury. Under such circumstances we are no longer inactive spectators, but commence a cautious system of stimulation, as formerly explained. If, on the other hand—as more frequently happens—reaction threatens to prove both "fast and furious," we interpose our repressing agency. We empty the bowels by the exhibition of an aperient enema; and aid this, by the more leisurely working of an internal purge. Seclusion from light and noise, elevation of the head, and continuous application of cold, are most carefully maintained. And if still the action is sthenic and in excess, we prepare to obtain a sedative result by bloodletting.

In the third stage, when reaction is plainly in excess, and inflammatory symptoms are fast developing themselves, the treatment is decidedly and actively antiphlogistic. Quietude and seclusion are more strictly enforced than ever; it being all-important to obtain *rest* of the organ affected, as completely as circumstances will permit. Blood is taken from both the system and the part; by venesection or arteriotomy, and by leeching. And such depletion is repeated as oft and as freely as circumstances seem to demand. Purgatives are actively administered; and it is well to remember that in inflammatory affections of the cranial contents, especially, powerful doses are required. Antimony or aconite may be given. But when the substance of the brain is plainly indicated as the site of the crescent inflammatory process, we do not hesitate to place the system rapidly under the influence of mercury; having full warrant for this in the delicacy of structure and importance of function which are involved (*Principles*, 3d Am. Ed. p. 168). Calomel is given in small doses, frequently repeated; and, usually, it is neither necessary nor expedient to combine it with opium. Not necessary, for there is a sluggishness of action in the intestinal canal, engendered by the disease, and consequently but little risk of the mineral proving purgative; and not

very guarded prognosis. The treatment found most suitable consists in a mild alterative mercurial course, with moderate and long-continued counter-irritation; a uniformly lax state of the bowels, and occasional purging; a most carefully regulated diet; restriction to moderate exercise of both body and mind, but more especially of the latter; avoidance of all sources of mental excitement, especially of such as are known to be besetting to the patient; the use of the cold shower-bath; and residence in genial exposure and climate.

Many patients recover, to all appearance, perfectly from concussion; and yet are subject to frequent and unpleasant remembrances of the injury. On attempting any usual exertion, either of mind or body, or on the occurrence of any otherwise trifling stomachic or intestinal disorder, intense headache supervenes, with some fever, and perhaps attended with disorder of sight or other special sense. Or, by even slight indulgence in wine, they are liable to undergo great mental excitement, little short of temporary delirium or insanity. Such persons, it is obvious, ought to pay great attention to regimen, to the state of the bowels, and to the avoidance of all circumstances likely to excite, or cause determination to the cranial contents. Indeed, it may be laid down as a safe general rule, that all who have once sustained any considerable concussion of the brain, must ever after regard their head as a weak point, which requires constant prophylactic care. And, for some time immediately succeeding the infliction of the injury, this truth should be more especially forced upon them. For, many most serious cerebral disorders have been the result of premature return to bodily exercise, mental occupation, or pleasures of the table, after a concussion thought at the time to be but very trivial.

A very insidious, and consequently dangerous, affection of the brain is apt to ensue as a remote consequence of concussion, more especially in young people. A slight injury of the head has been received by a blow or fall; and its immediate effects seem to be satisfactorily recovered from. Weeks—or, it may be, months—afterwards, the patient is out of health; he loses color, appetite, flesh, and energy both of body and mind; he is subject to headache, and occasionally complains of giddiness; the skin is dry and feverish; the secretions are altered; the eye has an unwonted expression, rather of languor than of excitement; the stomach is irritable, and occasionally rejects food; sleep is disturbed and unrefreshing. The ordinary remedies, directed to stomach, skin, and bowels, fail to relieve. The general ailment continues slowly to advance. By and by, the head symptoms assume a pre-eminence; and, at no distant period from that event, symptoms of pressure on the brain become plainly manifest. Most probably the issue is fatal. An inflammatory process has been slowly advancing in the cerebral substance; suppuration has at length occurred; and, in consequence, it is not unlikely that an acute accession has supervened on the previous chronic change of structure.

It is very obvious how the inobservant practitioner must be apt to mistake the true nature of such cases. The head is not suspected of originating the evil, until towards the close; when treatment, however suitable, can prove of but little avail. Diet is attended to, laxatives

are given, then alteratives; and then, probably, tonics; all without relief; the last class of remedies inevitably inducing marked aggravation of the disorder. It may be that the treatment is from the first of a tonic nature, and blindly persevered in, notwithstanding its manifest failure; the result is consequently still more untoward; and coma is rendered more early, more urgent, and more hopeless, than it otherwise might have been. The treatment, on the contrary, should be such as to counteract a chronic inflammatory process; conducted with such care and skill as the importance of the texture implicated so imperatively demands. Leeches are applied to the temples or occiput; and are repeated, perhaps, once and again. The head is shaved, and moderate counter-irritation is patiently maintained. A mild course of mercury is given. The intestinal and other excretions are attended to. Diet is sparing, and most carefully regulated. All excitement of both body and mind is avoided. And such treatment must be duly maintained, notwithstanding the patient, or other inexperienced observers, may not scruple to say that its rigor is quite disproportionate to the importance of the case. The surgeon knows the insidious and covert nature of the evil with which he is called upon to cope; and is not deceived by appearances. His main difficulty may lie in enforcing the measures which he knows to be essential. It were well that patients were in general as fully convinced, as are the members of the medical profession, of the truthfulness of the axiom, that "no injury of the head is too slight to be despised;" and that whenever any serious concussion has been sustained, the greatest prophylactic caution is expedient, long after the infliction of the injury.[1]

It is needless to expose the unsuitableness of the operation of trephining, in all cases of simple concussion.

Compression of the Brain.

It is unnecessary here to consider the question, Whether the substance of the brain is capable of condensation by pressure or not. We know that pressure applied to it, according to its suddenness and intensity of application, produces derangement of the functions of that important texture; and the consequent train of symptoms, varying in degree, are usually termed those of "compressed brain," or of "compression."

In concussion, the whole brain is affected; in compression, a portion only may be acted on. In the one case, the cause of disorder is of temporary application; in the other, it is of some duration. The symptoms, therefore, may naturally be expected to differ. In concussion, the depressing effect on the heart and general circulation is immediate and prominent; and the patient lies pale, cold, and pulseless. In com-

[1] "It will in general be found very difficult to persuade a person who has had what may be called only a knock on the pate, to submit to discipline, especially if he find himself tolerably well. He will be inclined to think that the surgeon is either unnecessarily apprehensive, or guilty of a much worse fault; and yet, in many instances, the timely use or the neglect of this single remedy (bloodletting), makes all the difference between safety and fatality."—*Pott*, i. 47.

pression—the injury being usually limited to but a part of the brain—the heart's action may, at first, be little if at all affected; the skin, consequently, may retain its natural warmth and hue, and the pulse its fulness. In concussion, immediately fatal, death takes place by syncope. In compression, the fatal result is due to coma. The essential peculiarity of the latter is, "that respiration takes place imperfectly, and ultimately is suspended, probably by reason of the defect of sensation. The circulation, and sometimes the animal heat, not only continue entire up to the moment when the last breath is drawn, but even survive the respiration for a short time; during which time, of course, venous blood moves along the arteries; but the venous blood, according to the general law established in the physiology of respiration, soon ceases to make its way through the capillaries of the lungs, and the circulation is therefore soon brought to a stand . . . . . We know from physiology, that the part of the nervous system which must be specially affected in these cases, when the failure of respiration is the immediate cause of death, must be at the sides of the medulla oblongata; but the part visibly injured is often considerably distant from this.[1]

Pressure may be made on the brain in various ways. By extravasation of blood; in its substance, on its surface, or between the membranes. By formation and accumulation of pus, or other products of the inflammatory process; also, either cerebral or intra-membranous. By fracture of the cranium, with depression of the broken part or parts. By lodgement of foreign bodies in the brain, or on its surface. By the formation of adventitious growth, in connection with either the cranium or its contents; exostosis, osteosarcoma, or osteocephaloma of the cranium; tubercular, or other tumor of the brain or its membranes. It is probable that compression is also occasioned by mere congestion; a state of overdistension of the bloodvessels, with advancing serous effusion.

It is highly important to bear in remembrance, that symptoms precisely similar to those ordinarily produced by compression of the brain may be, and frequently are, induced by other circumstances, when no apparent pressure is in operation. Certain poisons, for example, have this effect. But what is of more consequence in a surgical point of view, such a train of symptoms almost invariably attends on disorganization of the cerebral tissue by inflammatory action; and that, too, when the inflammatory products seem to be of such a nature as not to occasion pressure in any great degree.

In surgery, we have chiefly to do with those examples which are induced by depressed fracture, extravasation of blood, inflammatory exudation, and suppuration.

The most characteristic symptoms are found affecting the respiration and the pulse. Breathing is slow, laboring, and loudly stertorous; in concussion it was gentle and sighing. A peculiar whiffing, by the mouth, is not unfrequent, during expiration—as is observed in smoking, or in the ordinary repose of heavy sleepers; it is a symptom of untoward portent. The pulse is distinct and full, usually slow, but often at first not much altered as to frequency—not unfrequently intermittent; in

[1] Alison, Outlines of Pathology, p. 8.

concussion it was from the first rapid, low, and feeble, perhaps wholly imperceptible. Loss of consciousness is more complete than in concussion; the patient cannot be roused by any movement or noise. Loss of sensation is more complete; he may be pinched, or burnt, without in any way evincing perception of pain. Special sense is wholly dormant; he neither sees, nor hears, nor smells; at least, no result follows the application of stimuli to the eye, ear, or nose. Power of motion is wholly gone; the voluntary muscles are relaxed, flabby, and powerless; the limbs lie loose and incapable of motion. The eye is fixed; its pupils are dilated, and insensible to light. The skin is of a normal temperature, or perhaps even warmer; not unfrequently wet with perspiration; in concussion, it was cold, pale, and shrunken. The sphincters are relaxed; feces pass involuntarily. Expulsive muscles are similarly affected; the urine is, in consequence, retained; or, from paralysis of the sphincter as well, the urine may pass off involuntarily, not in a stream, but insensibly by drops.

Such is the general character of the symptoms peculiar to compression; varying, of course, in degree, according to the amount or nature of the injury sustained. They are of immediate or secondary accession, according to the cause; immediate, when the consequence of sudden hemorrhage, depressed bone, or impacted foreign body; secondary, when the result of tardy extravasation, suppuration, or inflammatory exudation. However originating, they are, after a time, masked and modified by the results of the inflammatory process, which seldom fails to become established in the injured part.

But the brain has the power of recovering from the effects of pressure to a certain extent, even although the agent of compression undergo no alteration; the organ seeming to accommodate itself gradually to its change of circumstances. Thus, in depressed fracture, symptoms of compression may be at first marked and even urgent; and yet may pass off in a day or two, without any elevation of the depressed portion of bone. This being borne in mind, we can readily understand how, by the time that the inflammatory process has begun, the symptoms of compression, at first considerable, may have in a great measure passed away; and how the case, consequently, may only present the ordinary symptoms of urgent inflammatory action in the brain and its membranes. This is something more than mere masking of compression, by the inflammatory process; it is supersedence. Certain functions of the brain are plainly re-established, though perverted; convulsive movements of the limbs occur; and delirium may supervene.

Compression may, like concussion, prove directly fatal, the patient perishing by coma; or, when the cause of pressure is removed, or even, as already stated, independently of this, the symptoms gradually abate, and the patient slowly recovers; or, ere yet any great mitigation in the symptoms of compression have occurred, those of an urgent inflammatory process kindled in the injured part become established, and these prove fatal; or, a similarly fatal issue may take place through inflammatory action, even although the immediate effects of compression had seemed to have been recovered from.

The indications of treatment adapted to compression are sufficiently

simple. To remove, if possible, the compressing cause; to watch the subsequent favorable progress of the organ to resumption of its normal state and function; to interfere, if need be, to avert inflammatory action; and to oppose the untoward advance of this, when, unfortunately, it has become established. When symptoms of simple compression persist, without any opportunity being afforded of removing the cause of pressure, to maintain, by suitable means, the action of the heart and lungs; so as, if possible, to afford time for the brain, by accommodating itself to its altered circumstances, slowly and imperfectly to resume its functions.

Between pure examples of concussion and compression of the brain there is no difficulty in drawing a sufficiently broad distinction, in practice, as well as in theory. The one, a case of syncope; the other, of coma. In concussion, the symptoms immediate; insensibility usually incomplete; the organs of special sense capable of being roused; the muscles contractile, and the limbs, under strong stimulus, undergoing movement; the breathing soft and gentle; the pupils not uniformly dilated, though insensible to light; the pulse rapid, small, indistinct, perhaps for a time imperceptible; vomiting; no involuntary evacuations; the skin cold, pale, and shrunk. In compression, the symptoms not necessarily immediate; insensibility complete; the organs of special sense incapable of being roused; the muscles relaxed, paralyzed; the limbs motionless, until recession of the state of compression, and advance of the inflammatory process; breathing labored, slow, and snoring; the pupils dilated and insensible; the pulse slow, distinct, perhaps full, sometimes intermittent; no (or seldom) vomiting; feces passed involuntarily; retention or dribbling of urine; the skin warm, and often bedewed by perspiration.

But it is very plain that comparatively seldom will pure examples of either state be presented to the surgeon. The blow or fall which produces severe concussion, is very likely to cause also laceration of the substance of the brain, or rupture of a vessel in the membranes, whence blood will escape, sooner or later, inducing a certain amount of compression. And, on the other hand, the injury which causes compression, whether by fracture or extravasation, must, at the same time, and primarily, have caused more or less concussion. In consequence, the two states, and their corresponding symptoms, are often, nay, usually, more or less commingled. According to the preponderance of either class of symptoms, the case receives its title; and, sometimes, it is not easy to say to what side the preponderance is inclined.

There is one class of cases, however, sufficiently distinct. The ordinary symptoms of concussion follow an injury of the head, and the patient rallies from them. Consciousness is completely restored, and is retained for some time. But, without the operation of any new external cause, insensibility returns; unconsciousness is more complete than before; and the symptoms now will be found presenting the characters of coma. Here is a combination of concussion with compression, yet

there is no difficulty in separating the case into its two component parts. The first insensibility was that of concussion; the second is undoubtedly due to compression. If the interval of consciousness have been brief—of hours—the compressing agent is, doubtless, extravasated blood; if it have been of considerable duration—days—the compressing agent is pus, or other inflammatory product.

It is right, also, to remember that, not unfrequently, part of the insensibility attendant on injuries of the head may be attributable to intoxication; and that, although this influence is of a transient nature, and to that extent favorable, yet that it predisposes to inflammatory accession.

Compression by Extravasation of Blood.

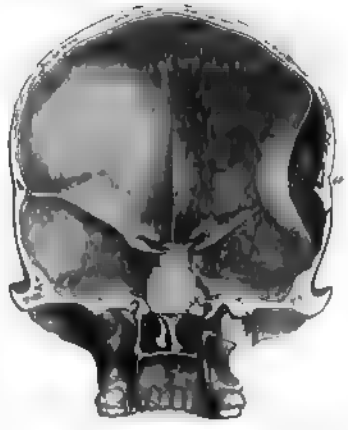
Escape of blood may take place immediately on infliction of the injury, or not until reaction has followed the direct effects of concussion. During the depressed state of circulation which obtains during the first effect of the injury, no blood may escape from even extensive cerebral laceration; but, if reaction be both speedy and intense, even the slightest lesion will be certain to afford a dangerous amount of that fluid.

The extravasation may be variously situated; between the skull and dura mater; between the membranes; on the surface of the brain—on its hemispheres, or at its base; within the ventricles; or infiltrated into broken-up cerebral substance. For practical purposes, it is sufficient to divide compressing extravasations into two great classes; those which are exterior to the dura mater, and those which are within that membrane.

I. *Extravasation between the Bone and Dura Mater.*

One of the effects of a fall or blow on the head is, by disruption of the soft parts constituting the scalp, to produce more or less swelling by sanguineous infiltration of that texture. Occasionally, a similar result is produced on the internal aspect of the part of the cranium struck, in the areolar and vascular connections of the dura mater with the bone. These being torn, escape of blood follows; either at the time, or subsequently on reaction; or at both periods; sparingly at first, more profusely afterwards. If any considerable vessel have been torn, the extravasation may be expected to be both instant and great. By such abnormal accumulation of blood, the dura mater is proportionally bulged inwards; and compression of the brain necessarily results. The blood, as in other examples of extravasation, is at

Fig. 5.



Extravasation of blood, separating the Dura Mater from the Cranium, at the ordinary site, by rupture of the middle meningeal artery, m. (Liston.)

first fluid, but sooner or later assumes the solid form; or, rather, by coagulation it separates into clot and serum.

Extreme cases of this nature, it is plain, are most likely to occur when the injury has been inflicted in the course of the middle meningeal artery. And, to occasion rupture of that vessel, it is not essential that fracture of the superimposed bone should take place. Mere concussion may suffice. If compound fracture exist, the blood is more likely to escape externally, than to accumulate, to any inconvenient amount, between the bone and membrane.

As indications of the event: In addition to the ordinary symptoms of compression, we have the peculiar site and nature of the injury. A smart blow has been received in the course of the meningeal artery; and is speedily followed by urgent symptoms of compression.

Such compression may be so grave as to cause death, by its direct effect. Or, farther escape of blood ceasing, the brain begins to accommodate itself to the amount of pressure already applied; at the same time, the compressing agent is being gradually diminished in bulk by absorption of the extravasated blood; and the patient slowly recovers. Or the inflammatory process is kindled after a time; and unhealthy suppuration is apt to ensue; reinducing symptoms of compression, more urgent than before, after perhaps a considerable interval of consciousness.

Treatment.—When the circumstances of the case are such as to leave little doubt as to the occurrence of this form of extravasation, at an accessible and defined portion of the skull, we can have no hesitation—if the symptoms of compression are urgent—in using the trephine; for the purpose of exposing the site of extravasation, and effecting relief by evacuation. If the blood be still fluid, it escapes at once; if coagulated, the solid portions may, if need be, be detached by a probe—delicately used.

Unfortunately, we cannot be certain, in almost any case, of the exact site of the extravasation; and, consequently, both our operation and prognosis require to be extremely guarded. A concussing blow operates chiefly on two parts of the cranium; the part struck, and the part immediately opposite; the one effect often termed the *coup*, the other the *contrecoup*. It not unfrequently happens that extravasation takes place in the latter situation; not at the part struck. But, failing in our search at one point, we are scarcely warranted in making a similar attempt at the other; for the extravasation may be yet elsewhere in a site not ascertained, and perhaps inaccessible.

If the symptoms of compression be not urgent, we do not interfere by operation. The brain gradually recovers. The extravasation is slowly absorbed. Our duty is to avert inflammatory action, if possible, by the ordinary means; to moderate it, should it occur.

II.—*Extravasation of Blood on, or in the Brain.*

As already stated, the blood may be variously situated; intramembranous; diffused on the surface of the hemispheres, or at the base of the brain; within the ventricles; or infiltrated into the cerebral tissue.

And, unfortunately, the most careful examination of the history, symptoms, and progress of the case, will often not enable us to ascertain, with anything like certainty, the exact site of the evil.

The symptoms are those of compression; more or less urgent in their character, and more or less speedy in their accession, according to the site, amount, rapidity, and time of the extravasation. Usually, the escape of blood is not immediate—at least to such an extent as to cause symptoms of decided compression—but secondary, on the occurrence of reaction. The patient may have been from the first insensible, by concussion; and this minor insensibility may be simply merged in the major insensibility of compression; or between the two there may be a greater or less interval of consciousness. The cerebral or membranous lesion, which permits the sanguineous escape, may follow on a concussive injury of the cranium; on extensive fracture of the cranium, with or without depression; on mere fissure of the skull—more especially when this is situate at the base; or on a penetrating wound of any kind.

There is the same prognosis as in the case of extravasation exterior to the dura mater. The brain may recover, and the extravasation be absorbed; or the brain, recovering partially from compression, suffers, perhaps fatally, by inflammatory accession, immediate or remote; or the compression is most urgent, and directly terminates existence by coma. Rapidity of extravasation is more important than the amount; and the site of the escape is of more consequence than either. A comparatively small quantity of blood rapidly, or at once, extravasated, will induce more urgent symptoms of compression than twice the amount which has slowly oozed from the torn vessels; and while a large flat coagulum may press with comparative impunity on the upper and anterior part of the hemispheres, a slight amount of blood acting on the base of the brain, more especially at its posterior part, never fails to induce the most serious and urgent consequences.

Treatment.—Prevention may be in our power. Concussion may occur, along with slight lesion of the cerebral substance; and from this lesion little or no blood may escape during the period of depression. The injury having been such as to engender a suspicion of these circumstances, it is plainly our duty to protract and repress reaction; when it does occur, to endeavor that it proceed slowly and calmly; or, if need be, by bleeding from the system, to reinduce the state of depression, and maintain it during a second period; the object being, to afford time and opportunity for efficient occlusion of the injured vessels by natural hemostatics. If too late, or otherwise unable, to prevent, we may yet hope to moderate and limit the extravasation. And this is to be effected by opposing reaction, keeping the patient quiet, with the head elevated, applying cold to the head, face, and neck, interdicting all nutritive ingesta, taking blood from the system, as circumstances may require, and acting freely on the bowels by purgatives. Our object still is to have not only the general circulation quiet and gentle, but to have blood circulating within the cranium as sparingly and as calmly as is compatible with such maintenance of the cerebral functions as is essential to life.

Extravasation having ceased, we hope that in due time the symptoms

of compression will begin to abate, the brain accommodating itself to the compressing agent, and this latter beginning to diminish by absorption. We ward off inflammatory symptoms, should they threaten, and maintain strict rest, quietude, and regimen; the last being very rigidly limited in regard to both fluids and solids, in order that there may be a state of system not only unfavorable to inflammatory accession, but also favorable to absorption of the extravasated blood. Unfortunately, we have no direct means of assisting in the latter indication.

A paramount indication undoubtedly is removal of the compressing cause, the extravasation. This can be artificially effected only by operation, by removing a portion of the cranium, puncturing the membranes, if need be, exposing the site of extravasation, and permitting, if not effecting, external discharge. Were the operation of trephining capable, always, or even often, of achieving this result, it would be held as generally advisable in such cases. As it is, however, the profession is much divided upon the question, some in favor of, others opposed to the proceeding. Among the latter we would beg to be enrolled; and for the following reasons: 1. It is difficult, if not impossible, to determine at what part of the *periphery* of the cranial cavity the extravasation has occurred; whether at the point struck, or at the site of the *contrecoup*, or at some other part, superiorly or laterally, or at the base. 2. It is equally difficult, if not impossible, to determine previous to the operation, at what part the extravasation has occurred as regards the *diameter* of the cranial cavity; whether between the membranes, on the surface of the brain, within its ventricles, or in its broken up tissue. 3. Supposing that the extravasation has been reached and exposed, it may be found either difficult or impossible to effect its removal. Coagulation has taken place. The fluid portion trickles away at once, but the clot is expanded in the form of a flat and broad cake, which cannot be dislodged and extruded without the infliction of such farther mechanical injury as shall render the occurrence of disastrous inflammatory action inevitably certain. 4. Supposing that the coagulum has been exposed and not removed, the patient is obviously much more unfavorably situated after than before the operation. Now, there is a certainty of inflammatory accession, in addition to the unrelieved evil of compression; and, under the combination, it is but too likely that life may give way. Before, there was but the compression; inflammation might have been averted; the brain, by accommodation, might have gradually recovered.

Thus, then, we hold, that in the case of compression by extravasated blood, the operation of trephining is to be considered as generally inapplicable. Operating, we are uncertain whether or not the trephine is over the site of extravasation; we are uncertain whether it may be necessary to puncture the membranes of the brain; and, that having been done, we may still fail in exposing the blood; we are uncertain of being able to remove the blood, even after it has been exposed; and we are almost certain to light up an inflammatory process of a most urgent,

and perhaps unmanageable character. In other words, we are sure to inflict injury, by perforation and exposure; we *may* succeed in counterbalancing this injury by a preponderating amount of benefit, by extrusion of the compressing agent, the escaped blood; but we are fully more likely to fail in obtaining the contemplated advantage; and then the proceeding proves to be altogether injurious.

But to all general rules there are exceptions. And here the exception consists in those cases of injury applied in the course of the middle meningeal artery, immediately followed by urgent symptoms of compression, with or without fracture of the skull, in which we can have little doubt of the following circumstances: 1. That the compression is caused by extravasation of blood; 2. That the blood has been extravasated at or near the point struck; 3. That the extravasation is situate exteriorly to the dura mater; 4. That the blood is yet mainly fluid, and therefore likely to escape readily outwards, on an aperture of communication being established; 5. That even if it have coagulated, extrusion may yet be effected, without necessarily exciting inflammation, either in the brain or in any of its membranes. Under such circumstances, we need not hesitate to apply a trephine to the injured part—when the symptoms of compression are sufficiently urgent to demand direct interference—with the full hope of affording most important and salutary relief.

We can also conceive it possible, that an injury may be sustained at a part of the cranium not connected with the course of the meningeal artery; that the symptoms of compression by extravasation may be both very urgent and very plain; and that the surgeon, after careful examination and consideration of the case, may feel satisfied that the site of extravasation corresponds to the part struck. The trephine is applied. If blood be found at that part, exterior to the dura mater, the issue is most fortunate. But if no blood be found, two questions naturally arise: Are the membranes of the brain to be perforated? or is another part of the cranial contents to be exposed by reapplication of the trephine? The latter question is certainly to be answered in the negative; the former, in the affirmative, only when the dura mater is elevated through the trephine-hole, tense, comparatively non-pulsating, perhaps fluctuating, or otherwise affording tolerably distinct evidence of the sought-for blood being lodged beneath.

Compression by the Accumulation of Pus between the Cranium and Dura Mater.

Such an occurrence may be preceded or not by sanguineous extravasation. There may be at first disruption of the dura mater from the internal surface of the cranium, with accumulation of blood between; perhaps to such an extent as to cause compression of the brain. This organ slowly recovers; and the patient seems convalescent. But, after some days, the inflammatory process is kindled in the injured part; suppuration occurs, and the internal bruise degenerates into an unhealthy abscess.

Or there may be no previous extravasation. The bone and dura

mater sustain a shock by the injury, but undergo no disruption either of themselves or of their connections. There may be at first some symptoms of concussion, and these pass away; but convalescence is interrupted by febrile disturbance of the system, followed by symptoms of compression. The inflammatory process has been established in the cranium, in the dura mater, or in both; and abscess forms between. The inflammatory action may have originated in the membrane, or in the connections of this with the bone; or in the bone; or it may have begun in the diploe, causing abscess there, and extending inwards; or the origin may have been exterior to the cranium, in the soft parts, secondarily involving the corresponding portion of the interior.

If a portion of the cranium have been rudely stripped of its pericranium, it may die; but it does not necessarily do so—as was formerly stated. Should necrosis take place, and involve the whole thickness of the skull at that point, there is necessarily detachment of the dura mater, interposition of pus between it and the bone, consequent bulging inwards of the membrane, and proportionate compression of the brain.

But detachment of the pericranium, with advancing necrosis of the external part of the bone, does not necessarily imply a corresponding state of matters within. The issue may be, and often is, merely an external exfoliation.

The dura mater is a more important and efficient membrane than the pericranium, as regards vascular nutrition of the bone. Detach the dura mater, and the bone may hardly live; strip off the pericranium, and exfoliation is by no means inevitable.

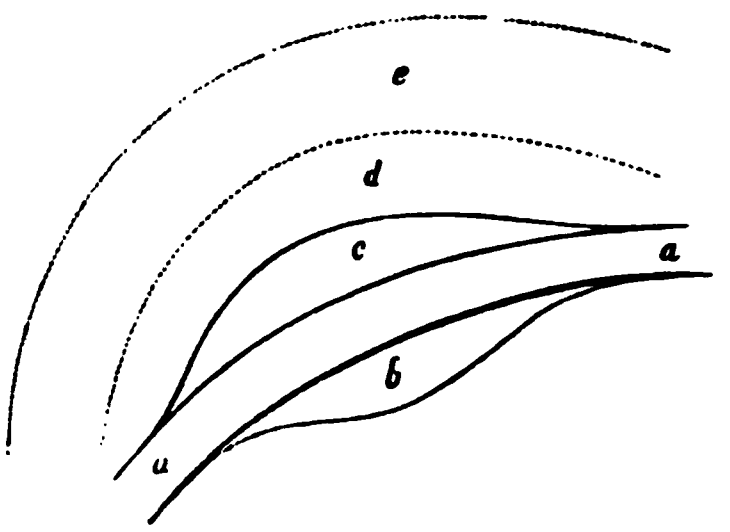
If the injury have not only denuded the external table of its investing membrane, but have also removed, at a corresponding point, the dura mater, by disruption and consequent extravasation, necrosis of the portion of bone so circumstanced, necessarily involving accumulation of pus between the dura mater and cranium, is inevitable. Also, if the dura mater be alone detached, and subsequently suppurate, necrosis of the entire thickness of the bone is still more than probable; though there may not be even an external wound.

However occasioned, the symptoms of compression from this cause differ very obviously from those produced by extravasation of blood. They are not of early occurrence; days, and sometimes weeks, elapse between their accession and the infliction of the original injury. Whereas, compression by escape of blood is either immediate, or removed from the time of infliction only to the extent of a few hours, at the utmost. Also, in the case of abscess, the symptoms of compression are invariably preceded by signs of the inflammatory process which causes the suppuration. As regards the result, the difference is still more striking. In compression by blood, the extravasation may cease, the blood is absorbed, and the brain recovers. But, in compression by pus, the compressing agent is ever on the increase; the abscess enlarges more and more; and pus is but little amenable to absorption. The bone is exfoliating, and, if it were separate, the matter would doubtless find an outward escape; but exfoliation is a tedious process; ere it has been accomplished, the membrane, growing more and more tense, and itself involved in structural change, ulcerates, or sloughs; purulent

irruption takes place inwards; and a more extensive, serious, and uncontrollable inflammatory action necessarily ensues. Or, previous to the giving way of the dura mater, a minor yet equally fatal inflammatory extension inwards, by contiguity, may have occurred. Or a sad complication may take place, by invasion of all the symptoms of pyæmia. Or, independently of any such aggravations, the primary evils of fever and compression may prove fatal.

The symptoms denoting formation of this dangerous abscess are twofold; as affecting the system, and as affecting the part. A man receives an injury of the head, without fracture of the cranium. He may undergo concussion or compression by extravasation; one or other, or both; or he may not. If he does so suffer, he rallies; and, for a time, seems advancing favorably towards complete recovery. But, after some days, he becomes restless, wakeful, and generally uneasy; his pulse rises and gets hard; the skin is hot and dry; and the other symptoms of inflammatory fever present themselves — moderate or intense, obscure or manifest, according as the inflammatory process happens to be chronic or acute; very frequently it is the former. Pain is complained of in the head; the eyes change their expression; and the cerebral functions begin to evince disorder. Rigor occurs, and is repeated. Suppuration is begun; and then supervene, more or less rapidly, the symptoms of compression—masking, in their turn, those of the inflammatory character. Then, as to the part. The bone is in a state of necrosis; and this condition will certainly be indicated externally. If there be a wound, the granulations, instead of presenting the appearance of health and healing, will disappear, or become pale and glassy; and the discharge may for a time cease—returning thin, non-laudable, perhaps sanguineous. If the pericranium be exposed, it will be found separating more and more from the bone beneath, with pus interposed. If the bone be denuded, it will be found white, dry, sonorous, non-vascular—in fact, at first dying, and speedily dead. If the scalp have not been divided, either by accident or by design, it is the seat of what is termed "the puffy tumor;" a swelling of greater or less extent, caused partly by accumulation of pus between the necrosed bone and its pericranium, partly by change of structure in the soft parts exteriorly, which are involved more or less in the extending inflammatory process, and are consequently the seat of effusion and exudation. Indeed, this "puffy tumor," though a valuable and peculiar sign of the internal evil, is not to be regarded as of a special nature; being only the ordinary product of ripe inflammation; œdema by serum externally, infiltration

Fig. 6.



Plan, illustrative of Abscess of the Dura Mater. *a*. The cranium. *b*. A suppurated space left by detachment of the dura mater. *c*. Ditto, by elevation of the pericranium; *b* and *c* constitute the central space of true inflammation; *d*, the arc of active congestion; *e*, that of simple excitement; *c*, *d*, *e*, constituting Pott's puffy tumor.

by fibrinous exudation more deeply, and accumulated pus overlaying the bone (*Principles*, 3d Am. Ed. p. 118).

These symptoms, local and constitutional, occurring together, denote interior suppuration at the injured part. The local signs "following a smart blow on the head, and attended with languor, pain, restlessness, watching, quick pulse, headache, and slight irregular shiverings, do almost infallibly indicate an inflamed dura mater, and pus either forming or formed between it and the cranium."[1]

Treatment.—The general principles applicable to the treatment of abscess must be carried out, if possible. The pus must be evacuated externally; and that at as early a period as possible; as soon as we are satisfied, by conjunction of the local and constitutional signs, that matter has formed. The local symptoms alone are not a sufficient warrant for operative interference; neither are the constitutional; but, when they come together in a marked and plain form, the surgeon is culpably negligent who withholds the trephine. By this instrument—chosen of a large size, to make the probability all the greater of disclosing the suppurated part—the dead portion of bone is perforated; and then the abscess is discharged externally, with immediate relief to the symptoms of compression. Be it remembered, however, that those of inflammation still remain, perhaps aggravated by the addition which the injury of the operation has occasioned. Antiphlogistics must still be continued; and much careful management is required, even in the most favorable cases, ere the patient is conducted to safe completion of the cure. It may happen that the inflammatory action is not checked; but, spreading both widely and in depth, proves ultimately fatal. In short, while it is obvious that the only chance of the patient's safety is by artificial evacuation of the matter, it is equally plain that the operation alone will not suffice, but must be followed up by the most careful general treatment.

It has happened that the abscess, burrowing between the dura mater and bone, has eventually reached the internal ear, and discharged itself externally by the meatus; the patient recovering. But, obviously, such an occurrence is a rare exception to a general rule, and cannot be trusted to in practice.

If, on removing a portion of skull by the trephine, matter is not found, a question arises whether our efforts at direct relief are to cease, or whether farther exploration is to be attempted. Is the dura mater to be perforated, in the hope that the site of abscess may prove to be beneath? Not, if the membrane present its usual normal characters at the part exposed; level, moving synchronously with the cerebral mass, smooth, of a brownish hue, and showing something of a silvery lustre. But if it be protruding through the cranial aperture, flocculent, non-pulsating, and either too dark or too pale in color—and, more especially, if it afford anything of a feeling of fluctuation when touched—we need not hesitate to puncture, and need not doubt to find an issue of purulent or other fluid from the wound. If the dura mater appear sound, and its puncture consequently be unwarrantable, are we permitted to re-

[1] Pott, vol. i. p. 41.

apply the trephine; either at the site of *contrecoup*, or in the immediate vicinity of the first application? Either of these procedures may be warrantable, if the symptoms of dura-matral abscess are peculiarly marked, and the surgeon is thoroughly convinced of its existence. But, as can readily be understood, the latter site of reapplication is the preferable. And, as already stated, a large size of trephine should be employed at first, to anticipate the necessity of such repetition. Only in very extreme cases, should the site of *contrecoup* be trephined. Having failed in the indicated spot, we proceed to other explorations with great uncertainty. Fortunately, however, it is comparatively seldom that the site of abscess is elsewhere than at the injured part.

But, if the case be under our cognizance from the first, we have a higher aim than the mere exercise of our art by operation; seeking to prevent the formation of abscess, not to attempt its cure. The patient who has sustained an injury of the head, of any severity, is carefully watched throughout the whole period of convalescence; and the first symptoms of inflammatory accession within the cranium are met by active and sustained antiphlogistics—more especially bloodletting, quietude, avoidance of all stimuli of both part and system, low diet, purgatives, and perhaps calomel; assisted, if need be, after a time, by counter-irritation.

When suppuration has taken place either in the substance of the brain or on its surface, the case is obviously not amenable to direct surgical interference, and may scarcely fail to prove fatal. Cure is beyond our reach; but prevention was not. And the latter indication should sufficiently occupy our regard in the previous treatment of the injury.

When a severe scalp-wound has been sustained, with bruising or fissure of the bone, it is not uncommon for the character of the wound to degenerate as in the case of dura-matral abscess, with some constitutional disturbance of an unpleasant character. But neither the meningitic symptoms, nor those of compression, appear. Suppuration has taken place in the diploe. If fissure exist—perhaps extending only through the external table—pus will be found slowly oozing outwards. Enlargement of the chink is necessary, however, for more free evacuation. If there have been no previous solution of continuity, the trephine may be used for removal of a portion of the external table.

The mischief may extend inwardly, and dura-matral abscess form, as previously stated; but, fortunately, such is by no means the invariable result; and is indeed little likely to take place, if suitable treatment have been adopted.

If phlebitis occur in the diploe, the case becomes eminently serious; partly on account of the direct effects of this disease; but mainly from the risk of pyæmia (*Principles*, 3d Am. Ed. p. 225). After injuries of the head, abscess of the liver is by no means uncommon; and it is

probable that at least many of these cases are connected with unhealthy suppuration, with phlebitis in the diploe.

Fractures of the Cranium.

In the child, much violence may be sustained by the cranium, with impunity. The osseous tissue is then elastic; it yields to the force, and is temporarily depressed, but without solution of its continuity; and, after a time, the depression is gradually effaced by a vital resilience, independent of external aid. In the adult, and more especially in the aged, the bone is of a much more brittle nature; and less force succeeds in effecting solution of continuity, more or less extensive.

The skull may be merely fissured, or the injured part is broken into fragments, implicating the whole thickness of the bone, with or without depression of these; or the external table alone is broken; or the internal table exclusively suffers; or both are penetrated by a sharp-pointed weapon, the internal sustaining the greater amount of injury. The fracture may be at any part of the periphery of the cranium, or may traverse its base; and, farther, it may be either simple or compound.

The dangers attendant on the injury are various: 1. By concussion. 2. By extravasation of blood within the cranium. 3. By excessive escape of blood externally from the wound. 4. By displacement of the fractured portions inwards, causing compression. 5. By inflammatory action, occurring in either the brain or its membranes.

The treatment will comprise various indications calculated to oppose these several results.

Fractures of the cranium, whether simple or compound, unite only by definitive callus (*Principles*, 3d Am. Ed. p. 658). Want of provisional callus, doubtless, may delay completion of the healing process; but all incommoding of the brain or its membranes by osseous bulging is avoided, which, otherwise, could not fail to occur.

Fissure.

Capillary solution of continuity is, in itself, a thing of but little importance. But the shock which has caused it may well occupy our attentive regard. The fissure itself, indeed, may, in its formation, have proved an actual advantage, rendering the concussion less intense and less hazardous than it might have been had the ringing calvarium remained entire.

The fissure may be short, and bounded by suture; or it may traverse several of these, and be of great extent. It may take place at the part struck, or at the site of the *contrecoup*. It may be conjoined, or not, with rupture of the dura mater at the fissured part; and, if it be so conjoined, compression by extravasation is likely to ensue. When the injury is situate at the base of the cranium, it is usually associated with such rupture; and extravasation occurring at this site, even to a slight extent, we have already seen to be of the gravest import (p. 49).

The symptoms attendant on fissure are usually those of concussion in the first instance; and these may be followed by those of compression

by extravasation. Inflammatory accession is not unlikely, giving the ordinary train of symptoms, varying according to the part and texture involved. And these, again, may be merged in the symptoms of compression by suppuration. If the injury be compound, the existence of fissure is ascertained by the finger or probe. If it be simple, the fissure may very probably elude detection, the case being treated as one of simple concussion.

Long ago it was the custom, in the treatment of this injury, to expose the fissure throughout its whole extent by incision, and to apply the trephine repeatedly in its course, probably in the hope of liberating extravasated blood. But no one now thinks of thus aggravating what is in itself comparatively simple. It is time enough to take up the trephine when symptoms of compression, by blood or by pus, are so plain and so urgent as to demand its use. It is not often, as already explained, that on the first count we are called upon to operate; and, if we have seen the case from the first, it may be our own fault if we have to interfere on account of the untoward result of inflammatory action. The treatment is chiefly expectant. We await reaction from the effects of concussion; watch the period when extravasation is likely to occur, and, if need be, then interfere—repressingly. That period of danger having passed, we are again quiescent, though alert; looking out for symptoms of inflammatory accession, and ready to oppose these with energy, should they appear (p. 40).

Fissure at the Base of the Cranium.

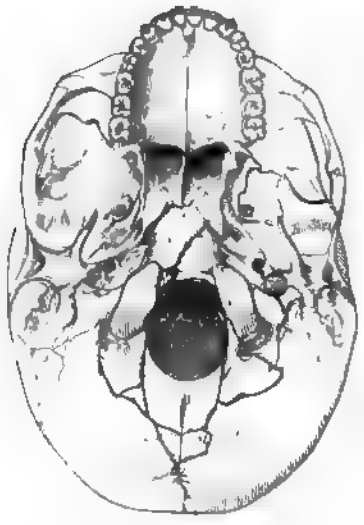
Solution of continuity, in this situation, is usually a fissure; disruption, more or less extensive, without comminution or displacement. The fissure may either extend through previously compact bone, or be a kind of diastasis—separation of the sphenoid from the temporal bones, for example, at the original points of union. As already stated, it is generally accompanied with laceration of the dura mater and internal hemorrhage; and, consequently, is invariably attended with the greatest danger to life. The important parts of the brain implicated are almost certain to be compromised in function, sooner or later, either almost immediately by extravasation or by inflammatory action at a more remote period.

The injury may be occasioned in various ways. The head may be crushed laterally, as by being jammed between a wheel and a wall or post; or, while the body is at rest, a severe blow is received on the vertex; and the strain of the shock, communicated through the temporal bones, produces a splitting of these, or tears open the connections with the sphenoid;[1] or the body, falling, alights on the vertex; and the

[1] "If a force be applied to the vertex, the superior borders of the parietal bones resist displacement downwards, inasmuch as their inferior borders cannot be thrown outwards in consequence of their being supported laterally by the overlapping of the squamous portions of the temporal bones; while the temporal bones, as M. Malgaigne has pointed out, are themselves supported by the zygoma, which constitutes on each side a true buttress, sustained by the superior maxillary bone. A shock, then, applied to the vertex, is directly transmitted to the temporal bone, and propagated through its petrous portions to the posterior part of the body of the sphenoid bone, the parts which most fractures of the base of the cranium traverse."—*Brit. and For. Med. Rev.* No. 29, p. 174.

spinal column, carrying both the weight and momentum of the body, is driven down upon the cranial base, the basilar process being probably broken through; or, falling from a height, the patient alights on his breech, or on his heels; and, again, a concussion sufficient for disruption may be so communicated to the cranial base. The extravasation is not always slight; it may be great, one or more of the large venous sinuses having been torn; then the symptoms are from the first most grave, and cannot but end fatally and soon.

Fig. 7.



Fissure at the Base of the Skull, involving the occipital and sphenoid bones. The patient fell from a ladder on the vertex, and lay comatose for some days before death. Extensive extravasation was found over the cerebellum and middle lobes of the brain. (Liston.)

The circumstances which lead to a suspicion of fracture at the base of the skull are: The kind of injury inflicted, such as already described; symptoms of compression, early and severe; escape of blood from the ears, nose, mouth; and discharge of a watery fluid from the ear, sometimes in considerable abundance. The last symptom, often termed "welling of the ear," is not immediate, but occurs after some days have elapsed. By some it is considered to denote escape of serous fluid from the sac of the arachnoid; others, contending that the phenomenon has been known to occur when certainly that sac was not opened into, believe that the fluid is but the serum of extravasated blood, trickling through the fissure; by all it is held as a sign of most untoward import.[1]

[In addition to the theories mentioned by the author as to the source of the fluid in question, it has been supposed by some to be the *liquid of Cotunnius*, contained in the cavities of the internal ear. But the objections to this view are, that the discharge from the ear, after such injury, is far too abundant to be thus accounted for, having occasionally amounted, it is said by Nélaton, to nearly a quart; the flow is likewise increased by the patient's blowing the nose, or taking a full inspiration; and, moreover, a similar fluid has escaped from the nostrils as well as the ear, after fracture at the base of the cranium (*Nélaton, op. cit.* p. 565). Another supposition is, that the serous discharge is owing to the escape through the fissure in the cranium of the *cerebro-spinal fluid*. This theory, which seems to be better supported than any other, is advocated upon the grounds that it accounts more satisfactorily for the amount of the discharge in certain cases; that the chemical composition of the two is identical; that when a careful anatomical examination of

[1] Laugier, Archives Générales, Août, 1845; also, Brit. and For. Med.-Chir. Rev. April, 1850, p. 342; Ranking's Retrospect, vol. ii. p. 100.

the lesions have been made, they have been found to be such as would permit of the escape of the cerebro-spinal fluid by rupture of the containing membrane; and that experiments instituted by Robert, for the purpose of testing the validity of this explanation, have served to confirm it (*Nélaton*). Against the assertion that the fluid is merely the serous part of the blood, effused by rupture of bloodvessels, are the conclusive facts that the amount of coagulum found bears no proportion to the quantity of the liquid poured out, and that the chemical composition of the serum of the blood and that of the latter are not the same.—Ed.]

Bleeding from the nose, mouth, or ear, following on severe injury of the head, is always suspicious, more especially if the patient be found in a state of insensibility. But, let it be borne in mind that such a combination of circumstances by no means certainly denotes the existence of fracture at the base; the insensibility may be that of concussion or of intoxication; the bleeding may proceed from mere laceration of the Schneiderian membrane and of the lining of the meatus, and from injury of the tongue by the teeth. When, however, we have such bleedings accompanied by urgent insensibility, obviously of the nature of coma; when the head symptoms either remain unimproved, or advance untowardly; and, more especially, when by and by the "welling of the ear" appears, we may safely conclude that fracture at the base has occurred.

[Another sign of fracture at the base of the cranium is *ecchymosis* beneath the conjunctiva of the globe of the eye and of the eyelids, particularly of the inferior. The manner in which this phenomenon is produced is obvious enough, and it is evidently an indication of value, as maintained by M. Velpeau. Fracture of the bones concerned in the formation of the orbit, must be ordinarily accompanied by sanguineous extravasation from rupture of vessels; and as the cellular tissue surrounding the eyeball, and connecting the conjunctiva to the sclerotic, is loose and yielding, it readily allows the blood to insinuate itself into its texture, and even, perhaps, to separate it more or less from its connections, until the fluid shows itself anteriorly upon the globe and beneath the integuments of the lid. In order, however, that this sign shall possess any exclusive value as indicating fracture within the cranium, it must be unaccompanied by external evidences of violence received upon or near the eye, as this cause might of itself occasion the ecchymosis in question without any internal lesion.—Ed.]

The treatment must plainly be prophylactic and expectant, as already advised in the case of compression by inaccessible extravasation. There is no room for direct operative interference. If the compression be happily got over, we must then be very watchful of inflammatory accession. In all cases prognosis is unfavorable; the majority prove fatal, either immediately by coma from extravasation, or more remotely from the effects of inflammatory action.

But it must be remembered that fissure of the cranial base may occur without any characteristic symptoms being evinced, the patient seeming to labor under mere concussion. The fissure may have been slight, and the solution of continuity may have been confined to the bone alone. The membranes remain entire, and there is no inward

escape of blood. Compression, by extravasation, necessarily does not supervene; and inflammatory danger may be warded off by ordinary care. Such cases, however, are of comparatively rare occurrence.

Fracture without Displacement.

The most common solution of continuity in the cranium is not a mere fissure, but a fracture, analogous to comminuted fracture of the long bones, reducing the injured part to the condition of being broken up into one or more fragments; and these may or may not be displaced. When there is no displacement, the dangers to be apprehended are such as are common to other injuries of the head, apparently less severe; concussion, excessive reaction, bringing either compression by extravasation or untoward inflammatory action; or a more insidious inflammatory process, occurring at a more remote period. The fracture may be simple, or compound, or with wound (*Principles*, 3d Am. Ed. p. 649). The compound is necessarily of a more unfavorable character than the others; danger by inflammatory action being greater and more probable. But the difference is, on the whole, not so marked as between corresponding injuries of the bones of the extremities. It is possible that the existence of a communicating wound may prove even an advantage, by permitting outward escape of inflammatory or other effusions, and so saving the important internal parts.

The treatment is prophylactic and expectant; according to the general principles already explained. There is as little necessity for immediate trephining, as in the case of mere fissure. If the injury have been sustained at the lower and anterior angle of the parietal bone, and is speedily followed by urgent compression, it may be advisable to apply the trephine in order to afford a freer vent for the meningeal hemorrhage. But, usually, the aperture already existing is sufficient for an outward drain. And again, should symptoms of compression by suppuration supervene, at a more advanced period, operative interference may be necessary to effect a free evacuation. In general, however, there is no necessity for the use of the trephine.

Fracture with Displacement.

If the fractured portion, or portions, be displaced inwards, the brain is more or less incommoded, and symptoms of compression ensue; proportioned usually to the amount of depression, and to the relative importance of that part of the brain which is injured. The upper and anterior surface of the brain, as formerly stated, may bear a very considerable amount of compression with comparative impunity.

The injury may occur without corresponding wound of the soft parts; but usually the fracture is compound.

The dangers are formidable. 1. By concussion. 2. By extravasation of blood. 3. By the results of inflammatory action on the brain and its membranes. 4. By compression, caused by the displacement.

The first three are to be opposed by fulfilment of the ordinary indications. The last is to be removed by operative interference. But in regard to this the question at once arises: Whether, in all cases of

depressed fracture, operative interference, for the purpose of replacing the depressed portion of bone, is necessarily demanded? Formerly, the answer was in the affirmative; at present, it is not so. Elevation of the depressed portion is had recourse to, with two remedial objects in view; to remove the cause of compression, and consequently the symptoms of this, when they exist; and also to remove a likely exciting cause of inflammatory action from the portion of cerebral tissue and membranes acted upon by the depressed bone. When the symptoms of compression are great and urgent, there is no room for hesitation; it is plainly the duty of the surgeon at once to attempt removal of the cause; and fulfilment of the former of the two indications is sufficient warrant for recourse to the operation. But if symptoms of compression either do not exist, or are slight, and are recedent rather than gravescent, the case is very different. If we operate then, it is only to fulfil the latter indication; removal of the exciting cause of an apprehended inflammatory process. And then this other question arises: Whether the continued pressure of a smooth portion of depressed bone, or the injury inflicted by performance of the operation, is the more likely to excite an untoward amount of inflammatory action? Experience has answered to the effect, that the greater risk is encountered by recourse to operation.[1] And, consequently, the rule is, to refrain from operation in all cases of ordinary depressed fracture, in which symptoms of compression do not exist. Farther, we know that the brain has the power of slowly recovering under a certain amount of pressure, even when that pressure continues undiminished. And, consequently, the rule of non-interference is extended also to those cases in which the symptoms of compression exist, but are by no means urgent, and seem to be slowly receding rather than on the increase. In young subjects, the call for artificial elevation must be especially urgent before it can with propriety be obeyed. For in them, it is to be remembered, a system of *mutual accommodation* may be said to be in progress; the brain not only becoming accustomed to its altered circumstances, but the compressing agent being also gradually withdrawn—the bone, by its inherent elasticity, slowly reapproaching its former level. In the adult, there is not the same resiliency; but then too something is done, on the part of the bone, to favor complete recovery of the functions of the incommoded organ. For after some considerable time the depressed portion is found to have become wonderfully smooth on its internal surface, and bevelled at its margins, by absorption; not ceasing to press, but now pressing with all gentleness on the parts beneath.

In ordinary fracture with displacement, therefore, we do not interfere by operation unless symptoms of compression not only exist, but are urgent. And in these cases the operation may not wholly succeed, the compression being perhaps by blood as well as by bone. In all

[1] Abundance of cases are on record, testifying the power which the brain has in bearing long-continued pressure, with comparative impunity, so far as inflammatory accession is concerned. One very remarkable instance is related by Sir A. Cooper (*Lectures*, p. 128), in which certain symptoms of compression endured for upwards of thirteen months, in consequence of the existence of depressed fracture; complete and almost instant recovery following removal of the depression by operation, at the end of that period.

other cases, we content ourselves with the expectant and prophylactic treatment, as if depression did not exist.

When the fracture is compound, comminuted, and depressed—that is, when fragments are not only displaced but completely detached from the rest of the cranium—we of course do not hesitate, in all such cases, to remove the loose fragments, with gentleness and care, whether symptoms of compression exist or not.

Also, let it be understood, that when, in a case of compound fracture, with displacement, sharp fragments seem to be dangerously in contact with the dura mater, much more, if this membrane be penetrated or punctured by them, we ought as soon as possible to raise or remove the offending portions, whether head symptoms exist or not; for in no other way can violent inflammatory accession be averted.

When operative interference is determined on, the indications to be fulfilled are sufficiently plain: to expose the parts, by suitable incision of the soft textures superimposed; to use the sound margin of bone, as a fulcrum, on which the elevating lever may rest; to insinuate the extremity of the lever beneath the displaced part, and to effect replacement with as little violence as possible. For the insertion and working of the elevator, sufficient space may already exist; if not, this is to be acquired, by gently lifting away a loose fragment, or by removing a portion of the sound bone, by means either of the saw or of the trephine. After the operation, much antiphlogistic care must necessarily be maintained.

[Mr. Guthrie, whose experience in cases of injuries of the head has been very ample, remarks: "The difference between a simple and a compound fracture of the leg is often considerable; it is more often dependent on degree; and when the fracture is nearly transverse, and the skin cleanly divided, the difference between it and a simple fracture of the same part is little more than one of time. I suspect this to be the case with an injury of the head, and my experience induces me to believe that the difference between the two states in fractures of the skull has been exaggerated; so much so, that I place no reliance on the supposition that there is more real danger in a case of fracture with depression, in which the scalp has been divided, than when it has been only bruised and not divided; and I apprehend that in all cases in which a fracture with marked depression is known to have occurred in an *adult*, it is the best practice to divide the scalp and ascertain the nature and extent of the depression." (*On Injuries of the Head*, p. 103.) And again, at page 111, he says: "When a fracture is accompanied by depression, and the broken portion or portions of bone would seem to be driven into the dura mater, or the brain, or to press so unequally upon them that as much mischief is likely to ensue from leaving as from removing them, and especially in an adult or middle-aged man, less harm will in general follow from ascertaining the fact, by dividing the scalp, and removing the broken pieces, than by doing nothing, more particularly when the presence of a foreign body is ascertained. If there be no symptoms indicative of mischief below the fractured part, the surgeon must then decide, after the best estimate he is able to make, of the probable evil which will occur from allowing the broken or depressed portions of bone to remain.

"I have said, that in young persons the brain will bear a greater degree of pressure and of irritation with impunity, than it will in persons of mature age, and that by far the greater number of cases in which recovery has taken place after fracture and depression of the skull, with injury of the brain, and even loss of its substance, have occurred in children, or in persons under the adult age; greater reliance may therefore be placed on the powers of nature in them, and less frequent recourse may be had to the aid of operative surgery in order to prevent mischief than in adults, even when the bone is fractured as well as depressed."

J. L. Petit, after relating the history of two remarkable cases of injury of the head, in each of which a depressed portion of bone was not elevated, and a portion of the inner table was separated and found adherent to the dura mater ten years afterwards, says: "Two or three of such wounds out of a thousand will get well without operation, but the remainder will die without it."—(*Guthrie*, p. 115.)

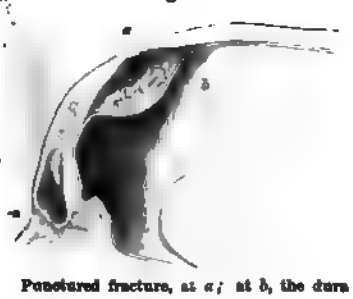
And the motive for operative procedure, even in the absence of symptoms of compression, in cases of fracture with known depression of the bone, is, to our mind, obvious and sufficient; the absolute infrequency of recovery from this accident without operation, is acknowledged; if symptoms of compression do not at first exist, but should supervene after that period has passed when such phenomena can reasonably be ascribed to extravasation, they can only be explained upon the supposition that inflammation of the membranes of the brain, together, probably, with the same affection of the brain itself, has taken place, a condition certainly exceedingly unfavorable to the success of the operation, rendering it a much more grave expedient than if it had been practised as soon as depression of the bone had been ascertained, particularly in hospital practice.

We would submit, therefore, that in these cases, surgeons may carry their fears of trephining too far for the welfare of their patients.—Ed.]

Punctured Fracture.

By the term "ordinary fracture, with or without displacement," is meant injury done by an obtuse body, causing solution of continuity throughout the whole thickness of the bone, and producing fragments composed of both tables of the skull, separated from their general connection in nearly equal proportions. A smooth, uniform, non-penetrating surface is consequently presented by the depressed portion to the brain and its membranes. But when a sharp-pointed substance, as the point of a poker or pitchfork, the corner of a spade, shovel, or hammer, or the angle of a sharp stone, impinges on and penetrates the cranium, the nature of the injury is very dif-

Fig. 8.



Punctured fracture, at *a*; at *b*, the dura mater represented detached, and spicula of bone lodged in the vacant space.

ferent. The external table is crushed by the penetrating body, to an extent proportionate to its lodgement. But the inner table, being much more brittle, gives way to a greater extent. It is broken up into fragments, usually small and spiculated, which, being driven inwards by the force of the blow, penetrate, or at least seriously irritate the coverings of the brain, producing inflammatory action. This may be general, involving the brain itself, and to the last degree dangerous; or it may be limited to the injured dura mater, causing abscess there, a result still most perilous to life. And to accomplish the latter evil it is not necessary that the fragments of the inner table should penetrate, or in any way mechanically injure the dura mater. It is sufficient that they are detached from the general cranium, and remain unremoved; they necessarily die, and, as sequestra, they inevitably become surrounded by purulent formation.

The rule of practice, then, comes to be plain. Whenever we are satisfied that punctured fracture has occurred, in other words, that the kind of fracture is such that splintering of the internal table is certain, we cannot too soon proceed to operation. We trephine immediately, so as to expose the fragments, and admit of their being carefully and efficiently removed. Unless they are taken away, antiphlogistics are practised in vain; inflammatory action becomes established at the part, sooner or later abscess forms, and then we find ourselves compelled to operate for relief of compressed brain, under very unfavorable circumstances. The least result is abscess of the dura mater; but it may be, that even the questionable chance by operation is not afforded, the inflammatory action having proved general, cerebral as well as meningitic, and speedily carrying off the patient. Taking the most hopeful view of the case, a necessity for operation is certain to arise, at some stage. And surely it is most prudent to operate at that time which plainly is most promising of an auspicious result. Better to operate at once, removing the paramount exciting cause of inflammatory action, and probably averting all casualties, than to attempt, subsequently, to retrieve or limit danger and disaster, already sustained.

The rule as to operation, then, is very different in the case of punctured fracture, from what is applicable to any other injury hitherto considered. We at once proceed to the operation of trephining, whether head symptoms are present or not. The mere existence of this form of injury is an amply sufficient warrant for our interference. Head symptoms, and those of a most urgent kind, are certain to supervene, if the operation be withheld; and they can be averted only by early removal of the splintered fragments resting on the dura mater. After the operation, antiphlogistic treatment must be sedulously maintained.

As in the case of concussion, it may be difficult at first to persuade the patient, as yet suffering but little, of the propriety of instantly submitting to treatment which may seem to him unnecessarily severe, and indeed quite unwarrantable. This obstacle is to be overcome by a calm yet earnest exposition of the certain danger which otherwise awaits him.

Obviously, it is our first duty to come to a just conclusion as to the

existence or not of this kind of fracture. A most minute examination is accordingly made. The scalp is freely divided, if need be, to expose the fractured point to sight as well as touch; and by a gentle yet determined use of the finger and probe, we endeavor to satisfy ourselves thoroughly; assisted in our decision by regard to the mode in which the injury has been inflicted.

Penetrating cuts of the Cranium—as by a sabre, axe, or sharp spade—often closely resemble punctured fracture, as to the kind of injury done to the inner table, and the immediate necessity for operation. When the cut passes sheer through both tables, the inner one is usually splintered; and the fragments press inwards, untowardly. They must be removed. The chasm of the wound is often sufficient to disclose their presence and site, to finger or probe; and it may suffice for removal also. If not, room is to be made by application of the trephine, or saw, as may seem most convenient.

[Mr. Guthrie was, we believe, the first to call particular attention to this kind of injury; and the observations which he has made concerning them, in his treatise on *Injuries of the Head*, prove the importance of a careful examination by a probe. In the first instance which he cites, in which an officer was struck on the head by a woman with a tomahawk, a wound was made into the left parietal bone, and he was knocked down; he soon recovered, however; a simple treatment was instituted, and the case was looked upon as a very favorable one; until the fourteenth day, he sat up daily and shaved himself; then, he observed that the left corner of his mouth was distorted, and his right arm partially paralyzed; the paralysis increased, he became comatose, and died. At the *post-mortem* examination, the inner table was found fractured, separated from the diploe, and driven through the membranes into the brain, which, at the point wounded, was in a state of suppuration (pp. 86–87). The examination, which Mr. Guthrie recommends for the purpose of ascertaining the true state of the case, consists in introducing a blunt probe into the wound, by which the depth of the inner table can be determined, and, of course, the question settled whether or not it be depressed, and the extent of the depression. Had this exploration been made in the case which we have quoted, a more suitable treatment would have been instituted—by elevation of the depressed bone—and the patient would, to say the least, have been much more likely to recover.—Ed.]

Fracture of the External Table, alone.

This is not an uncommon result of comparatively slight violence done to the calvarium, by bodies either sharp or obtuse. The external table alone gives way, and is perhaps driven inwards on the diploe. The most marked sample of the injury is afforded by fracture over the frontal sinus; in other parts of the calvarium, the accident occurs only in those of middle age, in whom diploe, with marked distinction between the cranial plates, exists. No operative interference is required, except in the case of the frontal sinus, and then elevation of the depressed

part is expedient. The treatment is, locally and generally, antiphlogistic. But, as formerly stated, inflammatory action may become excessive, and extend inwards; and suppuration in the diploe may lead to suppuration also on the internal aspect of the bone, necrosis of the implicated part ensuing. Under these circumstances, the operation of trephining is likely to be required, to relieve compression. Sometimes diploal phlebitis, with its sad consequences, ensues; too often baffling all treatment.

Fracture of the Inner Table, alone.

Fortunately, this is of comparatively rare occurrence; for, the outer table remaining entire, we have no means of ascertaining the nature of the injury, at the time of infliction. It may follow on a sharp concussing blow; in a patient who, by reason of age or other cause, has a vitreous table of unusual brittleness. The table may be simply severed, and not much depressed; then head symptoms are likely to prove both slight and transient. But, more probably, there is comminution as well as displacement; and then the usual hazard is incurred from the depressed and perhaps penetrating spiculæ. The trephine is likely to be called for, after a time, on account of dura-matral abscess.

Depression without Fracture.

As already stated, this occurs only in children, in whom bones are more prone to bend than to break. A dimple is made in the skull by external violence, and is slowly effaced by virtue of the inherent elasticity of the tissue. For a time, there may be symptoms of compression; but seldom of a marked character; and still more rarely urgent. Operative interference is neither necessary nor expedient. The treatment is simply antiphlogistic; and prophylaxis is long maintained (p. 42).

The Operation of Trephining.

The Trephine is a circular saw, worked by a light and rapid movement of the hand, whereby a portion of the skull is divided, and may be removed. For its application, complete exposure of the bone is necessary. If a wound already exist, it is enlarged to the necessary extent. If there be no previous wound, a crucial or other incision is made; so that, by reflection of flaps, the required exposure may be effected. The pericranium is carefully raised to an extent sufficient to admit of the free play of the instrument; but no farther. The centre-pin, sharp-pointed, having been made to protrude a short way beyond the serrated edge, is securely fixed there by its screw. And then, by firm pressure, accompanied with a slight rotatory motion, the centre-pin is fixed in the bone, so as to steady the instrument in its first movements on the external table. The teeth of the trephine are usually set so as to work from left to right; and it is well to have the crown fluted, on its lower half—this being found to favor its free play. The turnings are

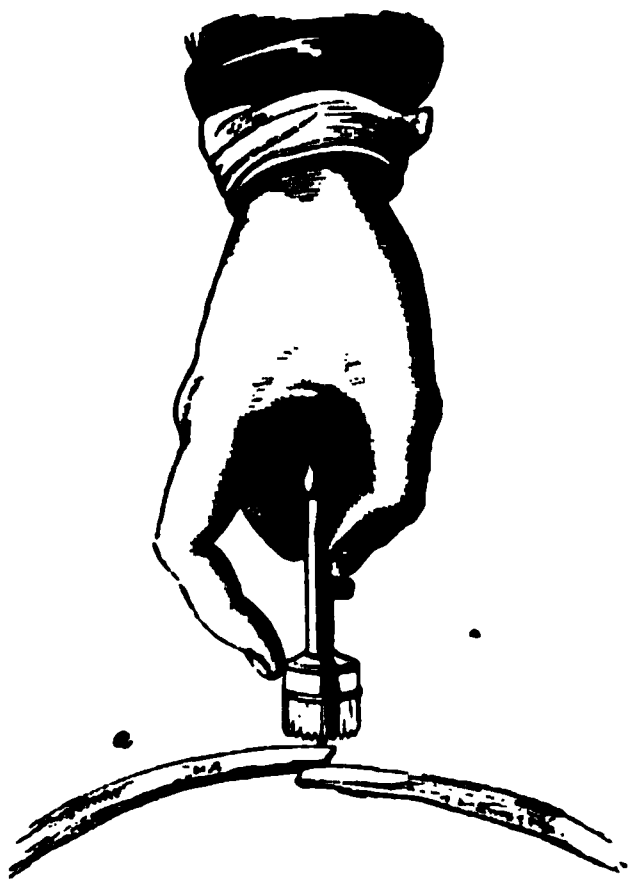
made steadily and rapidly; with very light pressure after the centre-pin has been fixed; and the light pressure is exerted only during the movement from left to right. When the sulcus has advanced to such a depth as is sufficient to retain the saw steady in the groove, the instrument is withdrawn, and the centre-pin pushed back entirely; to proceed with it still protruding, were not only to do what is unnecessary, but also to encounter much risk of injury to the dura mater at the latter part of the operation. The plain crown is reapplied, and worked steadily as before. There is no occasion for hurry; the operation itself, so far as the sawing of the bone is concerned, is comparatively painless; besides, it is usually undertaken while the patient is insensible; and in those cases where sensibility remains, experience has shown that anæsthesia by chloroform may be practised with perfect safety (*Principles*, 3d Amer. Ed. p. 733). If diploe exist, a change of sound and feeling is imparted to the operator, intimating that the saw has passed the external table. Then the instrument is worked very warily; and it is well to remove it from time to time, examining the sulcus with a probe or toothpick, to ascertain whether or not, at any point, section of the inner table may have been completed. If an aperture be detected, then the instrument, when reapplied, is inclined to the opposite side, and moved with increased caution and lightness. Want of parallelism in the two tables of the skull renders such precautions essential to a safe performance of the operation. Section having been completed at all points, the detached circle is to be removed. Perhaps it may come away in the crown of the instrument. If not, dislodgement is effected by the point of a lever, or by forceps; and the circle is gently withdrawn; in this step of the procedure, as well as in the last of the sawing, much care being taken to avoid injury to the dura mater. If any rough or sharp points are found on the margins of the aperture, these are to be removed by the elevator; otherwise, the dura mater might sustain injury.

[A very useful expedient in some cases is thus alluded to by Mr. Guthrie, *op. cit.* p. 130. "A musket-ball, striking directly against a bone, sometimes makes a hole not larger than itself, with or without any radiating fracture; and one trephine, if properly applied, will often embrace the whole of the mischief, and admit of the removal of the broken pieces. The trephine should be of a large size; and, as a centre-pin cannot be used, it may be made to turn very well, in most cases, in a flat but thick bar of iron, having a hole in the middle, of such size only as will admit the outside of the polished trephine to turn in it. Sufficient support for the instrument will be obtained by this means, until it has made a groove in the bone for itself, when the operation may be continued as it would be in an ordinary case after the removal of the centre-pin. Botal and Percy both allude to contrivances of this kind as eminently useful, and I have myself found it very advantageous."—Ed.]

When the operation is undertaken for elevation of depressed bone, it is seldom necessary to remove an entire circle. All that we desire is room sufficient for raising the depressed portion, and removing fragments if need be; and this can usually be accomplished by fixing the

centre-pin on the brink of the sound bone, and so removing by the saw only a segment of the circle.

Fig. 9.



Trephining. *a*, the sound portion of cranium; *b*, the depressed. The centre-pin fastened on the brink of the sound portion.

The operation, and the object for which it was undertaken, having been accomplished, the flaps are carefully replaced, and the general wound is invested by tepid water-dressing; care being taken that no undue bleeding takes place from the scalp; and, in regard to this point, it is to be remembered that vessels which do not bleed during the state of depression, may part with their contents freely on the establishment of reaction. Above the water-dressing it is well to place a few turns of a bandage, lightly applied, so as to afford support (p. 28); and this is more especially necessary when deficiency of the cranium happens to be considerable. The wound, in other respects, is treated in the ordinary way; union taking place by the second intention. Of course, rest is absolute, severity of regimen is extreme, and antiphlogistics are held in readiness for some considerable time after the operation. It has been proposed to replace the removed circle of bone, after completion of our object, in the hope of its becoming reunited; but such hope has been proved vain, as might have been expected.

When the wound has healed, the dura mater is found to have become incorporated with the soft parts exteriorly, and the breach in the cranium is not filled up by bone, but by dense membranous formation. A meagre film of new bone may be found at the mere margin of the aperture. And this, in time, extends centripetally; apparently by the slow secretive action of the parent bone alone, the pericranium, dura mater, and other soft parts, seeming to be incapable of ossific action. At the margin of the aperture the new bone may be of similar thickness with the cranium; but, as it extends, it shelves rapidly; becoming very thin as it approaches the centre. Many years are required ere osseous reparation is complete. And, in consequence, it is expedient for a long time to guard the imperfect part from external injury, a piece of leather or metal being worn over the cicatrix.

At one time, trephining was frequently performed, and on grounds much too slight. From the preceding remarks, the following brief deductions may be drawn, as to its present use: It is had recourse to, 1. On account of punctured fracture, as soon as possible, whether head symptoms exist or not; the object being to remove splintered fragments of the inner table. 2. On account of depressed fracture, accompanied with urgent symptoms of compression, when elevation of the depressed portion cannot otherwise be effected. 3. On account of dura-matral abscess, when local and constitutional symptoms sufficiently concur in pointing out the existence and site of this morbid condition; the object

being to effect external evacuation of the pus. 4. On account of urgent compression caused by extravasated blood; only when the circumstances are such as to indicate the seat of extravasation, and when that happens to be accessible.

Occasionally, the surgeon has been called upon to trephine, in cases of epilepsy, in which the disease seemed to be connected—in the relation of effect and cause—with a depression of the cranium, the result of former injury; or, in which circumstances seemed to point with much plainness to a certain spot of the cranium—perhaps the seat of internal enlargement of either a globose or spiculated character. The operation, under such circumstances, is of doubtful expediency; but may be performed, at the suspected spot, in obedience to the urgent entreaty of the patient or his friends.

Trephining has also proved successful on account of neuralgia dependent on inward growth from the cranium.[1]

In general, it is well to avoid applying the trephine in the direct course of the middle meningeal artery, or over the longitudinal sinus; yet, if it seem of decided importance that the instrument should be applied at such localities, the risk of hemorrhage need not deter us. A compress of lint, directly and accurately applied, will readily restrain the venous bleeding (*Principles*, 3d Am. Ed. p. 354); and if a similar application fail to stanch the arterial flow, the osseous canal, in which the vessel is usually imbedded, may be temporarily plugged by the insertion of a small portion of wood or cork (*Principles*, 3d Am. Ed. p. 345).

Wounds of the Brain.

The brain may sustain an incised wound, as by a sabre cut; a contused and lacerated wound, as by depressed fracture; a punctured wound, as by the thrust of a bayonet, pike, or any other sharp-pointed weapon; or a gunshot wound, of the class "contused and lacerated," by the penetration of a bullet. The likelihood of disaster is grave and imminent; by extravasation of blood, in the first instance; by inflammation and its results, secondarily. Treatment requires to be proportionally watchful and energetic.

Incised wounds may simply penetrate, or partially detach a slice of the organ. Such a flap is not to be at once removed, but should be replaced along with the corresponding investing textures, in the hope that reunion may occur. Examples are not wanting of a fortunate result.[2]

In contused and lacerated wounds, a certain amount of inflammation is inevitable. It is our business to moderate and control this by the ordinary means, so preventing disorganization and protrusion of the cerebral tissue at the injured part.

In punctured wounds, inflammation is not inevitable, unless foreign matter lodge, yet it is very likely to occur. The antiphlogistic precautions require to be very rigid.

In gunshot wounds, danger by inflammatory action is pre-eminently

[1] Boston Med. and Surg. Journal, August, 1846, p. 53.
[2] Larrey, Clinique Chirurgicale, tom. i. p. 140.

great. Not only is the wound of the contused and lacerated kind; there is also great probability of lodgement of the bullet, or portions of it, or of fragments of bone which have been displaced and driven in. And, it is well to remember, that the want of an apparently sufficient aperture of entrance is no sure proof of the ball having not penetrated and lodged; for, in the young more especially, the inherent elasticity of the osseous tissue may be so great as to diminish the space of entrance-wound very considerably. Contusion and laceration of the cerebral tissue and its investments, render a certain amount of inflammation inevitable; and the lodgement of foreign matter determines the amount and intensity of such action to be great and hazardous. Farther; foreign substances, penetrating deeply, are not unlikely to interfere with the most important portions of the organ, at its lower and posterior part; producing death, either instantly or at no protracted period, by direct interference with function.

Lodgement of Foreign Bodies.

When foreign bodies penetrate the brain, and their site of lodgement can be ascertained through the wound, the surgeon naturally becomes desirous of effecting removal of so palpable an exciting cause of the coming inflammatory action, the results of which he so much dreads, and not without good cause. If extraction can be effected easily, by forceps, probe, or hook, without much additional injury being inflicted on the cerebral tissue, it should certainly be attempted with as little delay as possible. If, however, the site of lodgement is unknown, or if the foreign body, of no great size, is found both difficult of access and firmly imbedded, it is better to abstain from the infliction of exploratory and evulsive violence, which would be certain to kindle an amount of inflammation quite uncontrollable. It is better to withhold all direct interference, contenting ourselves with busy antiphlogistics, to meet that amount of inflammatory action, perhaps amenable to control, which the infliction of the wound and the lodgement of foreign matter cannot fail to induce. We may happily succeed, though the general prognosis is, doubtless, unfavorable. There are instances on record of bullets, lodged deeply in the brain, remaining there harmless for years, incased in adventitious cysts, as happens in other textures (*Principles*, 3d Am. Ed. p. 628). Such fortunate patients, however, require ever to be most careful in avoiding all inordinate excitement of the cerebral functions and of the general circulation, for it has happened, again and again, that, after years of immunity, a debauch, or violent emotion, has induced a sudden and fatal coma.

The rule of practice then is: That, while it is very desirable, at as early a period as possible, to remove foreign substances which have lodged in the brain, in order that we may hope to contend more successfully with the coming inflammation, such removal is not to be attempted at the expense of farther and serious injury to the cerebral tissue. Such additional injury will render the inordinate action uncontrollable, and the patient must perish thereby. Leave the part undisturbed, and trust to general antiphlogistics; for it is possible that the

inflammatory action may be kept within moderate limits and the patient saved. Sometimes they make wonderful escapes, as in the recent instance of recovery after an iron bar had completely traversed a large portion of the brain.[1]

Hernia Cerebri.

By this term is meant protrusion of the cerebral substance through cranial deficiency. To constitute this morbid state, three things usually conspire; deficient space in the cranium; a corresponding aperture in the membranes of the brain, by wound, ulceration, or sloughing; and disorganization of the corresponding portion of cerebral substance by inflammation. It is most likely to follow on compound and comminuted fractures of the skull, with depression of the fragments, and laceration of both brain and membranes. The pouting prominence of brain at first merely fills the cranial orifice; it then shoots above it; and, in no long time, it may attain to a considerable size. Now, probably, its neck becomes impacted in the cranial aperture, is strangulated there, and sloughs; a fresh protrusion, however, takes place, and the progress is as before. Portion after portion of the upper part of the brain may be lost in this manner, without apparent and direct injury to the cerebral functions;[2] but, sooner or later, the formidable constitutional irritation which accompanies will prove fatal; and there is, besides, a risk of the disorganizing inflammation extending widely and fatally from the original site.

Prevention may be in our power. When the brain has been exposed by compound and comminuted fracture; and when there is a deficiency of the cranium, by removal of the fragments, with or without use of the trephine, the occurrence of cerebral protrusion, in consequence of inflammatory accession, is always to be apprehended; and two indications fall to be fulfilled: 1. To atone for the cranial deficiency, by affording uniform, steady, yet gentle support to the part, by compress and bandage; renewing the dressing as often as cleanliness and propriety of management require. 2. By antiphlogistics, timeous and efficient, to prevent or control the otherwise disorganizing inflammatory action.

An attempt to *cure* comprises greater difficulty. The obvious indications are, to restrain the inflammatory action, and to repress the exuberant growth. The former is to be fulfilled by antiphlogistic treatment; but this must be most warily conducted, inasmuch as by this time there is no tolerance in the system of severe remedies of that character. To fulfil the second, three means may be considered effectual; pressure, ablation, escharotics. Pressure is to be preferred; direct, accurate, steady, firm, but not severe; otherwise symptoms of compressed brain might be induced, with, not improbably, aggravation of the inflammatory action. The hydrostatic pressure, as recommended by Dr. Arnott, may be found highly available. Ablation of the cerebral protrusion is

[1] Bigelow; Brit. and For. Rev. Oct. 1850, p. 543.

[2] It has been supposed that the lost portions of cerebral substance are regenerated by a reparative effort on the part of the brain; and that thus the non-impairment of cerebral function may be accounted for.—*Lancet*, No. 1899, p. 760.

not expedient, unless the protruded part be in a sloughy condition, and must ultimately be lost; or unless pressure alone have been duly tried and found ineffectual. In either case, the protruding portion may be shaved smoothly off, by a knife, on a level with the cranial aperture; and then restraining pressure is to be resumed. The use of escharotics is, in no case, advisable.

The true hernia cerebri consists of cerebral substance more or less disorganized, often mixed with grumous blood, and other inflammatory products. Its formation is always a most unfavorable sign, and the ultimate issue is seldom but unfortunate. The affection is sometimes simulated, however, by coagulum. A mass of clotted blood, mixed with inflammatory exudation, but containing little or no cerebral substance, may protrude, presenting almost the same appearance as the genuine tumor. This is amenable to more summary treatment, and bespeaks a more hopeful issue, although usually a sign of active inflammatory action having seized on the part, and calling for a proportionate activity in antiphlogistics. The projection is at once removed by knife or fingers, and firm occupying pressure is applied to the cranial aperture.

[*Hernia cerebri* may be occasioned either by disease occurring within the cranium independently of external injury, or it may result from violence which has produced a fracture of the skull, usually compound, complicated or not with rupture of the membranes of the brain and laceration of its substance.

When dependent upon spontaneous intra-cranial disease, it is in the majority of cases a congenital affection, or comes on soon after birth, before ossification of the fontanelles; in either case the term *encephalocele* is applied to it. The protrusion ordinarily takes place at one of the fontanelles, most commonly the posterior; sometimes, though very rarely, the brain protrudes into the nostrils or sphenoidal sinuses, and forms a tumor at the root of the nose or in the pharynx.[1]

In the *Illustrirte Medizinische Zeitung*, vol. i. No. 3, is an account of three cases of congenital encephalocele, in which the protrusion occurred at about the junction of the nasal and frontal bones, through original deficiencies of the parietes of the cranium at this part. In two of these cases an error in diagnosis was committed, and the nature of the tumors was not ascertained until after operations were undertaken upon them.

In size, the tumor varies very much, being sometimes as large as a child's head. It is more or less rounded in shape, and occasionally pediculated, owing to the comparatively small dimensions of the aperture of escape. It is covered externally by the scalp, which is more or less thin and distended, according to the magnitude of the protruded mass; the pericranium and dura mater are closely adherent to each other, while the internal membranes are attached to the extruded brain.

The cause of this form of encephalocele is great increase of the volume of the brain beyond the capacity of the cranium; and this enlargement is almost always due to hydrocephalus. The structure of the organ, as well as of the membranes, is generally more or less decidedly altered,

[1] Rokitansky, Pathol. Anat. vol. iii. p. 372, Sydenham Soc. Ed.

as in hydrocephalus, and frequently important portions of it are wanting; the protrusion then consisting of the integuments and membranes filled with serum, while the partially developed brain lies at the bottom of the sac.

The *symptoms* of encephalocele need no especial mention here, the physical appearance and phenomena of the tumor being the most characteristic. These should be carefully investigated, in order that this affection may not be mistaken for *cephalhæmatoma*, a mere saccular protrusion of the arachnoid, vascular growths from the brain or dura mater, etc.

The treatment of this affection is the same as that of hydrocephalus; in addition, the tumor should be carefully supported, and moderate pressure may be tried. Occasionally, a spontaneous effort is made to cure it by free diuresis, of which an exceedingly interesting example is recorded by Dr. Baron, in the 8th vol. of the *Med.-Chir. Transactions;* or rupture of the membranes of the brain may take place, permitting the fluid to escape upon the exterior of the cranium, or even through the cribriform plate of the ethmoid bone, and downwards into the nostrils, both of which curious phenomena occurred in the case of Dr. Baron. But a cure is not to be expected.

The other variety of hernia cerebri is, as we have already said, the result of an injury which has fractured the cranium, with or without laceration of the dura mater and the brain; if the dura mater be not torn, it sloughs sooner or later from the pressure of the tumor. The immediate cause of the external protrusion is, as in the other form just described, a sufficient pressure from within to extrude through the accidental opening in the skull that portion of the brain which lies immediately beneath it, and which is now deprived of its accustomed pressure and support. It may also be, in some cases, that the tumor consists merely of a mass of fungous granulations, which have been produced upon the surface of the lacerated brain or its membranes; but this is not the usual condition.

The protruding cause may be supposed to be the vascular turgescence and the œdema of the cerebral tissue, which ordinarily accompanies active congestion and inflammation; but this can scarcely be admitted to be a sufficient cause to account for the magnitude which is often attained by the tumor; and, moreover, as Mr. Stanley remarks, in his paper on this subject (*Med.-Chir. Trans.* vol. viii. p. 29), the protrusion usually commences at a period when the condition of the patient indicates that the inflammation has subsided, or even ceased; or the injury inflicted may occasion an attack of meningitis, with consequent hydrocephalus, which, in turn, is sufficient for the production of the hernia. In some of the recorded cases the cause of the protrusion was undoubtedly an accumulation of *serous fluid* in the ventricles, as in several of the instances adduced by Mr. Stanley; the connection between the liquid thus situated and the external swelling is not always directly traceable, although its influence in effecting the extrusion of the portion of the brain implicated in the tumor is perfectly intelligible; but, in other cases, the tissue intervening between the ventricles and the tumor is ruptured, and the fluid even escapes externally (Mr. Stanley's paper, *op.*

cit. p. 34). In another group of cases, again, *pus* is generated within the cranium, and the pressure which it occasions forces out the brain through the accidental opening. The amount and seat of the purulent matter, of course, vary in different circumstances. It may be exterior to the brain and arachnoid membrane, as in Dr. Bright's 76th case (*Medical Reports*, part i. p. 161), in which a collection of pus was found upon the same side as the tumor, lodged upon the arachnoid, and forming a depression upon the surface of the brain a quarter of an inch deep in some parts. "A section was made perpendicularly through the fungus," (*i. e.* the protruding mass, which was on the right side of the forehead,) "into the ventricle, and through the *corpus striatum* of the right side, and a drawing made. The broken mass of red, brown, and curd color, with which the fungus was connected, extended to the surface of the ventricle, but had not opened into it. Around the broken mass several red points were visible in the substance of the brain, like small ecchymoses, such as are usually seen around a portion of brain broken by an apoplectic clot. In the posterior cornu of the right ventricle pus was deposited, and the surface appeared rough and softened; but as this was not examined until two days after the removal of the brain, the appearances were not very satisfactorily made out; a considerable quantity of pus lay between the arachnoid and the brain at the base, over the upper surface of the cerebellum, and at the under surface of the middle lobe of the cerebrum."

In other instances, pus is accumulated in considerable quantity in the substance of the brain, beneath the external tumor. Thus, in one of the cases quoted by Mr. Stanley (*op. cit.* p. 49), "the tumor was evidently continuous with the anterior lobe of the right hemisphere of the brain. Both the lateral ventricles contained some ounces of a bloody fluid. An abscess was found in the anterior lobe of the right hemisphere, containing between two and three ounces of pus. This cavity extended from the anterior part of the *corpus striatum* to the base of the tumor, but it had no apparent communication with either of the ventricles. The other parts of the brain exhibited no morbid appearance." In another case, recorded by Dr. Bright (*op. cit.* p. 163), the lesions were equally significant. The opening through which the brain was extended was in the frontal bone, just anterior to its junction with the parietal. "On dissecting back the scalp, the edges of the external wound were slightly adhering to the pericranium, which was detached for about a quarter of an inch from the opening in the bone. The projecting portion of brain had entirely receded. On elevating the cranium, the edges of the opening in the dura mater adhered to the bone, and the pressure exerted in elevating the bone pressed out a portion of the brain, from which a small quantity of purulent matter exuded, which was contained in a cyst, and did not communicate with the right lateral ventricle, or the abscess opening into it. The convolutions of the right hemisphere were very much unfolded, as is seen in hydrocephalus internus. On cutting into the right part of the *centrum ovale*, an abscess was discovered occupying a large space of the anterior and middle portions of the cerebrum; and communicating freely with the right lateral ventricle, a small portion of bone was found

deeply imbedded in the anterior lobe, and sero-purulent fluid was found with flakes in the lateral ventricles. The *plexus choroides* was not more vascular than usual. The quantity of fluid was from ten to twelve ounces; the piece of bone was connected with the larger abscess."

A case of hernia cerebri recently fell under my own observation, the prominent features of which may be briefly stated. A lad, about ten years old, was struck upon the left temporal region by a brick; compound fracture of the skull was produced, with laceration of the dura mater and of the brain. At the first dressing, portions of the brain escaped when the depressed bone was elevated, and from time to time, subsequently, similar losses of cerebral substance occurred. During the first few days after the injury, the boy was treated at home; afterwards, he was removed to the Pennsylvania Hospital, where he remained many weeks. While in the hospital, his general condition was remarkably favorable, and his mind usually clear; occasionally, he was a little feverish and soporose, but these symptoms were dispelled by mild purgative medicines. Soon after his admission into this establishment, a tumor appeared from the opening in the cranium, and gradually increased in size; pressure was first resorted to, to control its growth; but this means, as well as the application of caustics, failed to arrest or retard it. He was now removed from the hospital by his parents, and was under my care during the last month of his life. During this time, his mind was perfectly clear, he was quiet, not impatient, slept well, his appetite and digestion were good, and his nutrition was satisfactory. At this time, the tumor, which considerably overlapped the margin of the bony orifice, measured seven and a half inches around its base, and its perpendicular height was about two inches. Soon, a superficial slough, three or four lines in thickness, formed upon its summit, which gradually involved the whole superficies; a portion of it became detached, but large granulations rapidly made up for the loss of substance, the surface suppurating very freely and healthily. Compression and caustics having been fairly tried in the hospital, without benefit, I removed the tumor, with a knife, nearly to the level of the cranium; the boy experienced no pain, but little blood flowed, and no unpleasant symptoms followed. The tumor, however, was being gradually reproduced. On the morning of the tenth day after the excision, the condition of the patient was as favorable as possible; he ate for dinner, upon his mother's responsibility, an unusually large piece of meat, with potatoes in proportion; at about ten o'clock that night he was attacked with convulsions and fever, which continued unceasingly until the afternoon of the next day; no physician was sent for, and at my visit on the following morning I found the boy dead, and learned the above circumstances connected with his decease. No *post-mortem* examination was permitted; I was scarcely allowed to examine the injured part of the head with my finger; but from this hasty mode, I found that the edges of the bony aperture were smooth and rounded; the tumor had entirely disappeared, as in the case last cited from Dr. Bright; and instead of it, there was a depression beneath the level of the skull, and the surface of what was the tumor could be raised up like a sac which had been emptied of its contents; while beneath the brain, as it seemed, could be

felt resisting pressure. My inference was that an abscess had existed here, and that its eccentric pressure had caused the protrusion; but as to what had become of the fluid, whether it had escaped externally or not, I could gain no information.

It is to be regretted that there are so few carefully recorded cases of traumatic hernia cerebri to be found in our books. But the editor thinks that the causes above enumerated will prove more satisfactory in accounting for the protrusion than those ordinarily advanced, viz., vascular turgescence, and the presence of inflammatory exudations; though it is most likely that these are present in every case, and contribute, though not chiefly, to the production of the tumor. And if the causes which he has suggested, as inferences drawn mainly from the cases published by Mr. Stanley and Dr. Bright, be the most efficient ones, they point strongly to a mode of treatment which is not advised in the books, viz., to puncture of the tumor and evacuation of the superabundant fluid, if any such collection have formed, together with the judicious employment of pressure.—Ed.]

Paracentesis Capitis.

The operation of tapping the brain in chronic hydrocephalus, known to Hippocrates, and practised by the surgeons of the Middle Ages,[1] enjoys in the present day no great repute. Of modern practitioners, Dr. Conquest has shown the greatest favor to the procedure; and his experience of it has been by far the most favored by success.[2] Of nineteen cases in which the operation was performed, ten were "living when last heard of."[3]

Dr. West has collected, from various sources, fifty-six cases;[4] of which forty died, sixteen only recovering. Of the fatal cases, six died within four days; six within fourteen days; three within one month; nine within three months; only one survived the puncture six months; and none survived the last puncture more than thirty-five days. Death took place either by exhaustion or under cerebral symptoms. In many cases, in addition to the presence of much fluid, the substance of the brain was found softened; and, besides, "there existed, in sixteen of the cases, serious organic disease or malformation of the brain itself."

The serous accumulation usually takes place in the ventricles; and the brain, if not congenitally deficient, is spread out and attenuated, with its convolutions smoothed away; the ventricles ultimately constituting one large cavity covered by a thin layer of cerebral substance, which lies immediately beneath its own membranes. Sometimes, on the other hand—though comparatively rarely—the liquid is immediately within the dura mater; and the brain, which in these cases is usually partially deficient in its commissures, lies at the bottom of the serous cavity.

[1] Philosoph. Transact. vol. xlvii. Ann. 1751. [2] Medical Gazette, March, 1838.

[3] In Dr. Conquest's cases, the greatest quantity of fluid drawn off at one time was ℥20½; the largest total quantity ℥57, or ℥58; the greatest number of operations in any one case, five; performed at intervals of from two to six weeks.

[4] Medical Gazette, April 15, 1842.

Remedial means in chronic hydrocephalus consist of purgatives and mercurials, assisted by gentle and uniform pressure on the head. Failing these, the question arises whether the patient is to be abandoned to his fate, or an attempt made to save him by tapping. Some, acting on the principle "anceps remedium melius quam nullum," operate; the majority decline interference. Statistics, in the aggregate, as we have seen, hold out no flattering prospect of success. At the same time, in an otherwise hopeless case, if the parents, on a fair and full representation of every circumstance having been made to them, are willing and desirous to undertake the risk, there seems to be no insuperable reason against the operation being then performed. One of three events may occur; death may ensue speedily; or matters may be left much as they were, the head refilling; or a cure may be effected. Hoping for the last, the surgeon proceeds thus:—

A small trocar is introduced perpendicularly through the bregma, or in the coronal suture, at a safe distance from the longitudinal sinus and its feeding veins; and it is seldom necessary to penetrate farther than about two inches. Withdrawing the trocar, clear serum flows through the canula, and the more gradually it escapes the better; compensating pressure being at the same time made on the head, by the hands of an assistant. Should the pulse become quick, the pupils contract, and the face suddenly change its expression, the flow is stopped for a time. Faintness occurring, the child is laid horizontal, and a few drops of ammonia given in water. Sometimes blood comes through the canula, a sign that a vein has been punctured;[1] sometimes the flow becomes obstructed by a portion of brain, and the canula requires to be cleared by a probe.

After enough has been drained away, the wound is shut by means of collodion, and the whole head is carefully and uniformly supported by elastic strapping. Should slight cerebral excitement follow, it is well; for success is most probable in such cases; a healthful action being induced by the excitement, as after injection of hydrocele (*Principles*, p. 193). But in general, mild doses of the hydrargyrum c. cretâ are useful, as a check against over action. And when this does occur, our main reliance will be placed on mercurial influence, with topical depletion by leeches.

In the most favorable cases, we can scarcely expect a successful issue but by repetition of the tapping; and the amount of interval must be regulated by circumstances. In but one case have I ventured to operate. The first tapping proved highly satisfactory; the second terminated fatally by convulsions.

In connection with this chapter, besides the foot-note references, see Dease on Wounds of the Head, Dub. 1760; Pott, on Injuries of the Head, Lond. 1760; Pott's Surgery, by Earle, Lond. 1790; Desault, Oeuvres Chirurgicales, Paris, 1812; Abernethy's Surgery, vol. ii. Lond. 1815; Brodie, on Injuries of the Brain, Med. Chir. Trans. vol. xiv. part ii. p. 325; Gama, Traité des Plaies de Tête, Paris, 1835; A. Cooper, Lectures on Surgery, Lond. 1835; Sharp, on Injuries of the Head, 1841; Guthrie, on Injuries of the Head. Lond. 1842.

---

[1] Watson's Lectures, Medical Gazette, March, 1841.

CHAPTER IV.

DISEASES OF THE SCALP AND CRANIUM.

Erysipelas of the Scalp.

This disease may be idiopathic, and then it is usually of a mild character, so far as intensity of the local action, and its effect on texture, are concerned. It is very apt, however, to supervene on wounds; more especially if numerous dragging stitches have been unwisely used to effect approximation; and still more especially, if these stitches have been allowed to work their own way out by inflammation and ulceration. Such untoward accession to scalp wounds is also much favored by ungenial conditions of the atmosphere at certain seasons, as well as by previous derangement of the primæ viæ, or habits of intemperance on the part of the patient (*Principles*, 3d Am. Ed. p. 366). If the phlegmonous form occur, danger to texture is great, by diffuse infiltration, both above and beneath the tendinous expansion of the occipito-frontalis, and the constitutional symptoms are proportionally urgent.

The chief peculiarities of erysipelas of the scalp, in a practical point of view, may be considered to be: the unfavorable nature of the parts for suitable treatment of the milder examples, on account of the presence of hair; the unfavorable nature of the parts on account of the presence of a large amount of tendinous expansion, for safe progress of the more grave forms of the disease, and the dangerous propinquity of the affected part to an organ of the greatest importance, which is ever liable to suffer, either by extension of the inflammatory action or by metastasis.

Treatment.—When erysipelas threatens to seize upon the scalp, either directly or by extension from the face, it is our first duty to have clean abrasion of the hair effected, so that the necessary measures may be fully in our power when the accession does occur. In the case of extension from the face, the disease is usually of the simple character, and limited to the skin. And it is well to attempt to turn it from its upward course, by placing a guard by means of nitrate of silver (*Principles*, 3d Am. Ed. p. 178), while time and space still permit. For cure, hot fomentations, with or without punctures, usually suffice, in addition to the ordinary constitutional management. Cold, or other repellents, must never be employed; they may be grateful to the sensations of the patient at the time, but the risk by metastasis is overwhelming. Even the direct application of nitrate of silver to the erysipelatous part is not advisable, for a similar reason. Especial regard must be had to the

interior of the head, both during the progress of the disease, and for some days after its apparent decline. For, it has not unfrequently happened that convalescence has been suddenly and perhaps ruinously interrupted by inflammatory reaccession, not in the part originally affected, but in the membranes of the brain. Throughout the treatment, the head is kept high, the patient being almost in a sitting posture.

If the phlegmonous form declare itself in the scalp, and dangerous infiltration have already begun, we cannot too soon make the requisite incisions (*Principles*, 3d Am. Ed. p. 372) in those parts which plainly demand them. At first, the knife need not pass beyond the subintegumental adipose tissue, for the action has as yet gone no deeper; but if, from neglect or otherwise, infiltration be already subtendinous, the knife must pierce tendon too, otherwise the invariably aggravating tension cannot be relieved, pain will increase greatly, and the inflammatory fever will rise higher, matter will burrow rapidly over the pericranium, and probably beneath it also, and the action will extend widely, perhaps involving the cranial contents, in at least a minor form. Timeous incision through the tendinous expansion is the only means whereby such extreme mischief may be mitigated; but it is surely better practice, by an earlier and less extensive wound, to prevent all such casualties, effecting recedence of the action while it is yet limited to its original site, the skin and subintegumental tissues.

When burrowing of matter has taken place beneath the tendinous expansion, it is not necessary to lay the track open throughout the whole extent, but only, by the formation of a dependent opening, with a suitable counter-opening, if need be, to prevent purulent accumulation, and to afford the parts an opportunity of effecting reunion by granulation. To assist in this indication, uniform support by bandaging is very useful, after the acute stage has passed by (p. 28.)

When the scalp has been undermined by pus, even extensively, it does not follow that it must necessarily slough in any part of the undermined portion. Its vascular supply is not so dependent on the subjacent areolar tissue as is that of ordinary integument, the course of the ramifications of the occipital and temporal arteries being rather cutaneous than subcutaneous, and the isolated skin, bearing its own vessels, consequently retaining its supply of blood but little impaired.

Aware of the dangers of erysipelas of the scalp, it is plainly our duty in the management of all wounds of the head, however trivial they may at first seem to be, to avoid everything, in part or system, calculated to induce an undue amount and kind of inflammatory action, more especially if by previous indisposition, or sinister atmospheric influence, the patient seem to be predisposed to erysipelatous accession.

Tumors of the Scalp.

Encysted tumors, commonly called Wens, are found more frequently on the scalp than in any other situation; and they are seldom single. In general, they are regarded mainly as deformities; but, when they inflame and open, they may become both troublesome and dangerous.

In some cases danger has arisen from the progress of mere growth; the calvarium having become absorbed, and consequently deficient, by the inward pressure of the tumor. The only advisable mode of treatment is removal by the knife. The main danger to be encountered is inflammatory action, assuming the erysipelatous character; and this must accordingly be provided against by suitable constitutional treatment, as well before as after the operation, and by gentle and careful management of the wound.

If the tumor be of large size, it is removed by regular dissection. By two elliptical incisions, of merely subcutaneous depth, the redundant integument is detached; and then the cyst, carefully preserved entire and tense, is leisurely dissected from its connections, and taken away along with the portion of sacrificed integument. The flaps of saved skin are then replaced; and, on oozing of blood having ceased, they are brought into accurate contact, the wound being treated with the hope of adhesion. Approximation is effected by strips of isinglass plaster, or by collodion and lint; and, to facilitate the application of these retentive means, the surrounding scalp has been previously shaved. If oozing of blood have not wholly ceased, it is advisable to maintain accurate pressure on the whole wound for an hour or two, so as to prevent inward accumulation of coagulum, an event necessarily fatal to adhesion (*Principles*, 3d Am. Ed. p. 195). Stitches are neither necessary nor advisable.

If the tumor be no larger than a nut or small egg, it is unnecessary to remove any integument, and regular dissection is therefore not required. A more summary process suffices; that by incision, extrusion of the contents, and evulsion of the cyst (*Principles*, 3d Am. Ed. p. 333).

If an encysted tumor, in a patient advanced in years, have inflamed and suppurated, and be in process of intractable ulceration, it is well to destroy the part effectually, either by escharotics or by excision; the latter method the preferable, for malignancy of action is otherwise apt to be assumed.

Solid tumors, of various kinds, are occasionally found in this locality. Of these, the most common is the adipose, seldom of large size, and amenable to the ordinary treatment, excision. Of whatever nature the tumor be, its removal should be early, ere incorporation has taken place, either with the scalp above, or with the fibrous textures beneath (*Principles*, 3d Am. Ed. p. 300).

Erectile tumors very frequently occur in the scalp. They are best treated by deligation, with or without previous reflection of the integument, according as this happens to be involved or not in the morbid structure (*Principles*, 3d Am. Ed. p. 562). The very large tumors of this class, sometimes met with on the side of the head, need not be tied all at once, but may be dealt with in portions; different parts being strangulated at different periods. Experience has proved that, in such cases, attempted excision is fraught with the utmost danger to life, and that deligation of the main arterial trunk or trunks, is an insufficient remedial means; cases may occur, however, in which, as part of the cure, the principal arteries may be obliterated as they enter the tumor;

the twisted suture being employed for this purpose, as in the case of veins[1] (*Principles*, 3d Am. Ed. p. 575).

Malignant tumors occasionally form in the scalp; following the usual course, and amenable to the ordinary treatment. Benefit is to be expected only by free excision, and that can be practised with expediency only at an early period. Medullary tumors may commence in the soft tissues, and involve the hard secondarily, fully as often they originate in the bone.

Malignant ulcer of the scalp is not uncommon, beginning as a warty excrescence, or the result either of an originally simple sore, or of an open and degenerate encysted tumor. Early and free removal is had recourse to, if the lymphatics as yet present no contraindication.

Fig. 10.

Cancerous Ulcer from the Scalp.

Pericranitis.

The pericranium becomes the seat of an inflammatory process, with or without external injury having been applied. Acute action may be the result of wound or bruise, following the ordinary course of such action in fibrous tissues; or acute and suppurative action may extend from the surface, as in erysipelas of the phlegmonous form. The usual antiphlogistic indications require to be fulfilled.

Idiopathic pericranitis is more frequently chronic than acute, and seldom occurs but in the adult, who is saturated with the rheumatic diathesis, or who has sustained injury of the system by mercury and syphilis; one or other, or both. The ordinary symptoms are present; pain, swelling, heat, tightness; and the nocturnal exacerbations are peculiarly marked (*Principles*, 3d Am. Ed. p. 394). The affection may resolve, leaving little or no structural change; or the resolution is incomplete, an enlargement of bone remaining, resembling a diffused node; or true inflammation is established, and the bone suffers, to a greater or less extent, by ulceration, caries, or necrosis. Usually, the periosteum of other parts of the skeleton is at the same time and similarly affected; and the bones most likely to suffer along with the cranium, are the clavicles, sternum, tibiæ, and ulnæ.

Treatment is mainly constitutional. The primæ viæ having been brought into a tolerably satisfactory condition, a sustained exhibition of the alteratives well known to be suitable to such cases is proceeded with; sarsaparilla and iodide of potassium, either together or alternately. The latter, especially, is found most beneficial. Locally, leeches and fomentations are applied at first, then counter-irritation. The inflammatory process having been removed, and its results only remaining, nothing is more effectual than the endermic use of a strong solution of iodine. Throughout the whole period of cure, the hair is kept either shaved or short. Atmospheric exposure is carefully avoided, and regimen is rigidly non-stimulant. If matter form acutely, it must

[1] Dr. Warren, American Journal of Medical Science, April, 1846.

be evacuated, freely and early. If the abscess be chronic, opening is delayed, and discussion by iodine attempted. Even when rough and spongy bone can be plainly felt through the chronic collection of pus, iodine should still be persevered with, along with the internal use of iodide of potassium, when the affection is dependent on a constitutional cause; for, in such cases, discussion is not unlikely to follow patient perseverance, even under circumstances by no means promising. Should acute or subacute accession supervene, however, the abscess becoming tense and crescent, let incision be no longer delayed.

In obstinate examples of pericranitis, causing mere change of structure, with slight swelling, but great pain, the general health is apt to give way greatly from want of sleep, and consequent exhaustion. In such cases it is essential to give opiates; and, if the more proper alteratives have proved ineffectual, mercury may be given in guarded doses (*Principles*, 3d Am. Ed. p. 398).

Affections of the Cranium.

Abscess and ulcer of the cranium occur from ordinary causes, and are amenable to ordinary treatment (*Principles*, 3d Am. Ed. p. 411).

Caries of the skull is preceded and accompanied by interstitial absorption (*Principles*, 3d Am. Ed. p. 281), and seldom occurs but with a vice

Fig. 11.

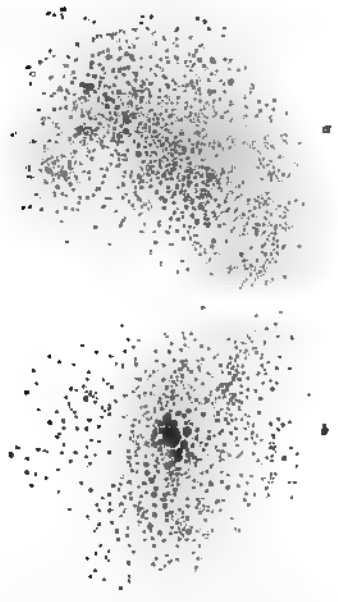


Fig. 11. Interstitial Absorption in progress, in the cranium; at *a*, just begun; at *b*, more advanced. It may stop here, producing a merely cancellous state of the tissue; or it may advance, becoming merged in ulceration, and producing caries, as in Fig. 12.

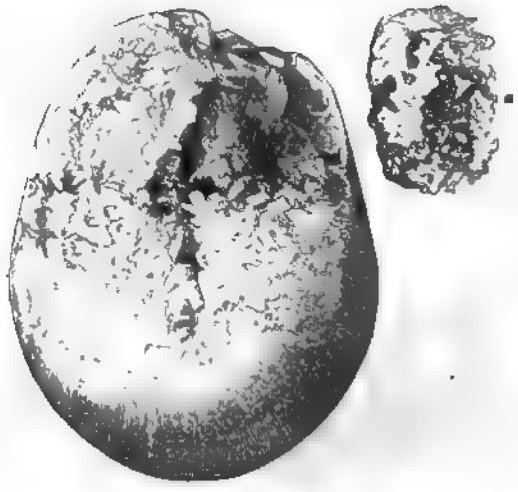
Fig. 12.

Fig. 12. Different portions of the same Skull as Fig. 11; at *c*, ulceration established, surrounded by interstitial absorption; at *d*, caries, with necrosis in the centre; interstitial absorption still accompanying.

of system; seeming to be rather a symptom and sign of this than to constitute a disease in itself. And the predisposing vices of system are scrofula in the young, syphilis, mercurio-syphilis, or the ill effects of mercury alone in the adult. Treatment, accordingly, is chiefly constitutional. Locally, the diseased structure is exposed, and removal of the carious surface is effected by the gouge, or by escharotics, chloride of zinc, or red oxide of mercury (*Principles*, 3d Am. Ed. p. 416). Sometimes nature is provident in this matter, and herself effects the necessary clearance; the useless parts coming away spontaneously, as small sequestra. If the whole thickness of the cranium be involved, there is of course additional danger by dura-matral involvement; and precaution requires to be exercised accordingly. Sometimes, unfortunately, a triumvirate of scrofula, syphilis, and mercurialism reigns in the system of the miserable patient; and then, as can readily be understood, the local affection proves particularly intractable.

Necrosis may involve the whole thickness of the skull, the result of wound or not—usually the former. Then, as already stated, there is

Fig. 13.



Mercurio-Syphilitic Caries of the Skull. a. A portion detached, in the form of sequestrum.

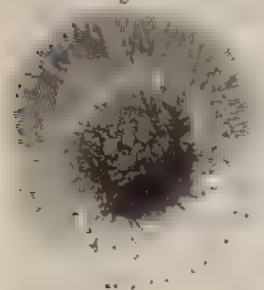
risk to life by purulent accumulation between the bone and dura mater; and, if no external aperture already exists, as by fracture, the use of the trephine is demanded (p. 54).

Exfoliation, or death of the external portion, is more frequent than complete necrosis; the result either of external injury, or of chronic idiopathic pericranitis. The usual course of superficial necrosis is followed here as elsewhere. Ordinarily, we await patiently spontaneous separation, and then remove the sequestrum. Sometimes, when detachment is tedious, acceleration may be effected by the application of escharotics (*Principles*, 3d Am. Ed. p. 436). And sometimes it is necessary to interfere and forcibly elevate the dead portion, which, though

separated from the hard textures, is yet confined by soft granulating structures around (*Principles*, 3d Am. Ed. p. 436).

In no form of necrosis of the cranium does the ordinary formation of cortical and substitute bone occur. And how fortunate such an arrangement is at once becomes apparent, when we consider what would be the inevitable consequence of new bone bulging inwards on the dura mater. If the sequestrum have been superficial, healing is effected by a depressed cicatrix, as after simple ulcer of bone (*Principles*, 3d Am. Ed. p. 411). When the whole thickness has perished, atonement is made for the deficiency, as after the operation of trephining (p. 68).

Fig. 14.



Ulcer of Cranium, healed. The margins bevelled off, and sloping down. The surface studded with imperfect granulation. From the same cranium as Figs. 11, 12.

As in the case of caries, many examples of exfoliation of the cranium are dependent on the mercurio-syphilitic vice of system; and require constitutional treatment accordingly.

In connection with the traumatic form, it is well to remember that detachment of the periosteum—even rudely, and with some bruising of the bone itself—does not render the occurrence of exfoliation inevitable (*Principles*, 3d Am. Ed. p. 421). The part may, and frequently does, recover. And the treatment, in the first instance, is to be conducted with a view to such a result; the flap of integument being carefully replaced, the wound approximated, and speedy healing sought for.

Exostosis of the cranium is not uncommon, of a dense, ivory character, and usually of small size. Fortunately, the site of growth is on the external aspect of the bone. No treatment is required. The affection is a mere deformity; and not even that, unless apparent from want of covering by hair.

Fig. 15.

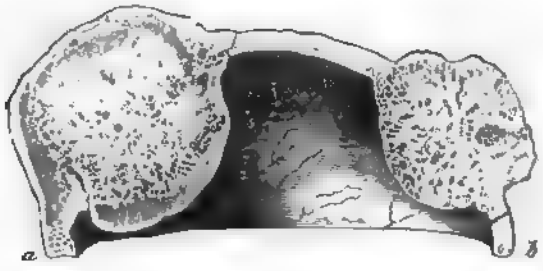
Several Ivory Exostoses clustered on the Os frontis.

Spiculated exostosis sometimes grows from the interior of the calvarium, inducing intense neuralgia, or epilepsy. As already stated, there are some few cases so plainly marked, as to admit of the offending body being removed by the trephine (pp. 68, 69).

[Large exostoses, as well as the spiculated form, do sometimes grow from the inner face of the cranium, and produce compression of the brain and other alterations of its functions, in proportion to their size, rapidity of growth, &c. The accompanying illustrations, taken from the work of M. Vidal de Cassis (vol. iii. pp. 115–116), afford very good examples of the kind; in one, the growth is both external and internal; in the other, it is exclusively internal. These developments are usually

the offspring of syphilis; they are generally accompanied by fixed pain in the affected part, and gradually occasion more or less disturbance in

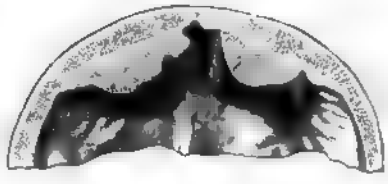
Fig. 16.



Large Exostoses of the Cranium projecting both internally and externally at *a* and *b*.

the functions of the brain. The diagnosis of the affection must be somewhat doubtful. Constitutional treatment, such as is applicable to tertiary syphilis generally, should be resorted to; uncertainty as to the precise seat, and especially the dimensions of the tumor, even if its existence could be substantiated, must be regarded as opposing serious objections to the employment of the trephine.—Ed.]

Fig. 17.



Large Internal Exostoses.

Tumors of the calvarium—osteosarcoma and osteocephaloma—are rare; more especially the true osteosarcoma. When they do form, no treatment save mere palliation is advisable. The site and connections of the affected part forbid operative interference.

Polypus of the frontal sinus is a rare affection; and, in its first stages, of difficult diagnosis. When detected, cure may be obtained by removing the bone to such an extent as will permit evulsion of the growth, with subsequent cauterization of its site.[1]

[*Fungous tumors of the dura mater* deserve mention in this connection. Attention was first particularly called to them, in 1774, by Louis, then Secretary of the Royal Academy of Surgery of France.[2] Since then this subject has been investigated by Sandifort, Siebold, Lassus, the Wenzels, Chelius, Velpeau, Lebert, and some others.

Fungous tumors of the dura mater are usually regarded as of *cancerous* nature, more frequently of the encephaloid than of the scirrhous variety; but M. Lebert found, in several cases which he examined, that the microscopic elements of the tumors belonged rather to the *fibro-plastic* than to the *cancerous* class (*Physiol. Patholog.* t. ii.). They grow ordinarily from the dura mater, most commonly from its external sur-

[1] Brit. and For. Med. Rev. Jan. 1846, p. 186.
[2] Memoirs of the Academy of Surgery, Sydenham Soc. Trans.

face; occasionally, similar tumors appear to proceed from the pia mater; they more frequently correspond with the vault of the cranium than with any other portion. They are usually single; though, as in several of the cases cited by Louis, more than one may exist in the same subject. The base of the tumor is in most instances larger than the free portion; sometimes, however, the growth is more or less pediculated, the external portion being larger than the aperture in the bone, through which it escaped from the cranial cavity.

After a time, the excrescence, by constant pressure upon the inner surface of the cranium at some point, produces absorption of the bone, and shows itself externally—the margin of the bony orifice being usually rough and irregular, but thin. Before complete perforation of the bone has taken place, the patient generally complains of a fixed pain, more or less severe, together with functional disturbance of the brain, or of some nerve, if any be implicated by the tumor, as occasionally has happened with the nerves of the special senses. After the bone over the tumor has become much thinned, it yields to the pressure of the latter, and allows the swelling to be detected by manipulation; and if now the prominence be pressed upon, a crackling may perhaps be elicited, as if from a piece of parchment, from the yielding of the delicate osseous covering; such was the case in the celebrated instance of Le Gallois, quoted by Louis (*op. cit.* p. 85), in which the tumor was first detected by a barber who was shaving the patient's head. When protrusion has actually taken place, the outgrowth is rounded, elastic, firm at first, but usually becoming somewhat softer; it pulsates synchronously with the heart and brain, unless it be constricted by the bony aperture through which it has escaped; but the pulsation is different from the special and universal expansion of an aneurismal tumor; the mass is usually susceptible of being returned into the interior of the cranium, and when this is done, symptoms of compression of the brain, or paralysis, or other disturbance of function of some nerve are induced, but a less amount of pressure than is requisite to accomplish this, has been found to relieve the pain of which the tumor is the seat, sometimes to a very great degree; if, as is sometimes the case, the free portion of the tumor be larger in circumference than the aperture in the bone, of course reduction cannot be accomplished. The progress, rapidity of growth, duration, and size of these tumors are subject to no uniform or definite rules. The duration varies from several months to forty years (Desnonvilliers, *Compendium*).

The positive *diagnosis* of this affection, before protrusion has taken place, is impossible; afterwards, it may generally be recognized, great care being employed to distinguish it from ordinary solid tumors and abscesses of the scalp, also from cephalhæmatoma, hernia cerebri, erectile tumor, aneurism, &c.

The result of this disease, if left to itself, is pretty certainly fatal, nor is the prognosis much more favorable when surgical aid has been resorted to. Previous to the external appearance of the tumor, the internal administration of narcotics is ordinarily all that can be done; occasionally, the application of a trephine directly over the seat of the pain may be justifiable, and has afforded temporary relief. After the growth

has appeared externally, the application of caustic, or of the ligature, to the presenting portion, or the removal of this by the knife, has frequently been tried, and has undoubtedly, in most cases, produced a speedier death than if the mass had been left to itself. M. Boyer proposed that the trephine should be applied sufficiently often to the bone, to expose freely the whole base of the tumor, and that the latter, together with the contiguous dura mater, should be removed. But this formidable operation, though performed by him and by others since, has been successful in so few instances, that its repetition seems hardly warrantable, especially if, as may be pretty certainly determined, the tumer be cancerous.

In the 3d vol. of the *Transactions of the American Medical Association*, p. 403, Dr. J. C. Warren, of Boston, describes an operation which he performed upon a tumor of this kind. He made four flaps of the ulcerated skin covering the tumor, which was situated on the right side of the forehead and right temple, and dissected them as accurately as possible from the soft cerebriform fungous mass; he then removed the latter piece-meal, traced it to its origin in the dura mater, upon the surface of which he freely applied the actual cautery. The hemorrhage was great, but was suppressed by two or three ligatures and the actual cautery. The subsequent symptoms were favorable. The wound healed very slowly, but was entirely closed at the end of some months, and has remained so up to the present time (three years after the operation). "She has now no unpleasant feelings in her head, nor any other symptoms of disease."

Dr. Warren had on a previous occasion operated upon a similar tumor, in a more advanced stage of the disease, but it returned and the patient died.—Ed.]

[For information on the subject of *Fungous Tumors of the dura mater*, See Louis, Memoirs of the French Academy of Surgery; Lebert, Physiol. Pathol.; Boyer, Œuvres Chirurg. t. iv.; Nélaton, Patholog. Chirurg.; Desnonvilliers, Compendium, t. ii.; Velpeau, Dict. de Médecine, t. x.—Ed.]

CHAPTER V.

AFFECTIONS OF THE ORBIT, AND ITS CONTENTS.

I. Affections of the Orbit.

Orbital Inflammation

Is usually the result of injury, when primary. Sometimes it is of a secondary character, and unconnected with violence done to the part, an extension of inflammatory action from a neighboring part, from the eyeball, or from the scalp. Most frequently it follows injury, and the action is usually intense, suppuration being certainly and soon attained. Pain is great and increasing, tension is great, for swelling is hindered by the unyielding process of the periosteal lining of the orbit, termed orbital ligament, which confines the orbital contents in front; vision is more or less impaired by compression of the eyeball, and this organ, according to the amount of deep swelling, is more or less protruded; the eyelids are red and œdematous, inflammatory fever is intense, and the cerebral functions are often prominently disordered.

Treatment comprises the ordinary antiphlogistic indications. When a wound exists, careful examination is expedient to ascertain whether or not any foreign substance, as straw, wood, iron, has penetrated and lodged, and if such an obvious exciting cause of inflammation be detected it is forthwith removed. Leeches are applied in numbers; in some cases, general bloodletting may also be found advisable, and the antiphlogistic accessaries to bloodletting, aconite or antimony, purgatives, quietude, &c., will not be neglected, vomiting being avoided, for obvious reasons. The part is diligently fomented, and as soon as indications exist, however faint, of matter having formed, an evacuating incision is practised, it being obviously of the greatest importance to penetrate the orbital ligament at an early period of the suppuration. On evacuation of matter, the symptoms are speedily mitigated, the tension, throbbing, and intense pain almost immediately. If incision be delayed, spontaneous evacuation takes place, but not till after much suffering, considerable destruction of texture, and dangerous impairment of function in the eyeball.

Wounds of the Orbit.

These are usually of the punctured kind. As just stated, they are liable to prove the exciting cause of intense inflammation, more especially when there is lodgement of foreign matter. And the probability of the

latter circumstance must always be regarded in practice. The wound having been ascertained to be clean and free, is carefully approximated, and cold is continuously applied, with much care, in order to avert inflammation, if possible, and secure union by adhesion (*Principles*, 3d Am. Ed. p. 593). If inflammation supervene, antiphlogistic treatment must be early and active; a suppurating wound is then inevitable, but we hope to avert deep and confined abscess, which is prone to form by extension of the inflammatory action beyond the wound's track.

But such injuries acquire a still higher importance in reference to the parietes of the orbit. A penetrating wound of the orbit, as by a bayonet, pike, or pitchfork, is not unlikely to produce fracture of the orbital plate, and the fragments of the broken bone, driven inwards, are certain to penetrate or otherwise injure the brain or its membranes, endangering life, perhaps immediately, by extravasation of blood—more probably by the results of inflammation at a more remote period. Such wounds, therefore, require to be treated with the greatest caution. The extent of injury done to the bone is ascertained as soon, as accurately, and yet as gently as possible. If loose fragments are found to exist, these it is well to remove, the external wound being dilated, if need be, for this purpose. And when the spicula are certainly displaced inwards, injuring the important parts in that direction, an attempt should be made to take them away, whether they seem detached or firm. The indication is as paramount as in punctured fracture of any other part of the cranium (p. 63). This important part of the treatment having been satisfactorily accomplished, by dilatation of the external wound, and the suitable use of fingers, forceps, and probe, the patient is placed on his face, with the wound unapproximated, until bleeding cease, internal extravasation being thus rendered less likely to occur. Then the parts are brought together, and antiphlogistics are diligently employed, both locally and generally, in order to avert, if possible, an untoward amount and extent of the inflammatory process.

Tumors of the Orbit.

Hard tumors of the orbital parietes are uncommon. The dense ivory exostosis produces little inconvenience, is usually of inconsiderable size, and requires no treatment. The cancellated exostosis, of a pedunculated character and larger dimensions, may incommode the eyeball. If so, the nature of the case being plain, an incision may be made on the origin of the growth, its neck may be cut by the bone-pliers, and, by careful dissection, the offending substance may then be removed (*Principles*, 3d Am. Ed. p. 450).

Soft tumors are of more frequent occurrence. And they may be practically divided into three classes. 1. The simple and sarcomatous; amenable to excision. 2. The erectile; capable of cure, but not by direct operation. 3. The malignant; usually forbidding operation, and admitting only of palliation.

1. The simple tumors—simply sarcomatous, fibrous, fatty, cystic—may form in the orbital areolar tissue, unconnected with either the bone or its periosteum; and the growth may be either of idiopathic origin, or a remote consequence of slight injury. Enlargement is slow, gradual,

comparatively painless, and unattended with inflammatory signs; not likely therefore to be mistaken for orbital abscess. As in the latter affection, however, outward growth is prevented by the orbital ligament; compression of the eyeball follows; and this organ may be more or less protruded from its socket. At first, sight is not lost, and scarcely even impaired; for stretching of the optic nerve is gradual, and nervous as well as cerebral tissue has a very considerable power of accommodating itself to displacing agencies gradually applied. Ultimately, however, the stretching and displacement are attended with more or less impairment of vision.

By careful inquiry into the history of the case, we satisfy ourselves that the tumor is of the simple kind. Of what exact species it may be, it is not easy to determine; for the tense orbital ligament stretched over the swelling obscures tactile examination. Generally, however, we are able to satisfy ourselves on another point; whether or not the tumor is movable—connected or not with the bone and periosteum—consequently removable or not, entire, by operation. When convinced that the tumor is simple and movable, we do not hesitate to attempt its extirpation. A wound is made of sufficient extent, in a line parallel to the fibres of the orbicularis muscle. By cautious dissection, the tumor is reached and exposed. It is then laid hold of by a volsella, or hooked forceps; and evulsion outwards being steadily yet gently maintained, extirpation is rendered both easy and safe. The point of the knife is moved very warily, when near or in contact with the orbital parietes; for these, by the pressure of the tumor, may have been much attenuated; and a careless movement of the instrument might cause penetration. The eyeball and optic nerve are also carefully avoided. After removal of the tumor, the former is carefully readjusted in its proper place; and restoration of its functions usually ensues. The wound is brought together, and treated for adhesion.

Partial removal even of the simplest tumor, in this situation, is obviously inexpedient. For, reproduction will almost certainly occur from the portion which remains; and such second formations are very apt to prove of an unfavorable kind.

2. The erectile tumor is occasionally found occupying the orbit. It is seldom congenital, but occurs suddenly, in after life; and its origin is usually attended with a considerable amount of pain. At first an obscure deep swelling is found, causing more or less inconvenience; but as it enlarges and approaches the surface, the ordinary characteristics of erectile tissue become sufficiently apparent. Often the cheek is covered with large veins—recipients of the blood from the more active vessels within.

This tumor cannot be treated directly; neither knife nor ligature are advisable. Yet, if no remedial means be adopted, the probable issue will be unfortunate; by enlargement, ulceration, hemorrhage; by involvement of the orbital parietes, and subsequent pressure on the brain; or by mere constitutional irritation. Experience has shown that deligation of the corresponding carotid, is capable of effecting a cure, not by obtaining consolidation and obliteration of the dilated vessels, but, probably, by diminishing their supply of blood, removing the impulse of the heart's action, and so favoring resumption of the normal caliber.

And free bloodletting, after the operation, would seem to contribute materially towards this result (*Principles*, 3d Am. Ed. p. 563).

3. Tumors of a malignant kind—medullary—are no unfrequent occupants of the orbital cavity. Generally, they originate in the eyeball; but occasionally this is involved only secondarily—the origin being in the orbital areolar tissue, in the periosteum, or in the bone. The sole hope of cure is by extirpation of the whole orbital contents. And this is expedient only when the disease is recent, apparently limited to the soft parts, and capable of entire removal.

II. Affections of the Eyelids.

Injuries.

Ecchymosis is of frequent occurrence in the eyelids; the areolar tissue being lax and delicate. Ordinarily, it is the result of a bruise or blow; but it may follow a wound, more especially if oblique or subintegumental; the application of leeches is almost certain to produce it, to a greater or less extent. It is important as a deformity. A patient having received an injury likely to be followed by ecchymosis, is anxious that this should be prevented; and the escape of blood having occurred, he is equally anxious that the discoloration should be removed. Many remedies are popularly in vogue for both of these ends. For the former, the continuous application of cold by wetted lint, with quietude and abstraction of all stimuli, is both suitable and easily obtained; if begun immediately on receipt of the injury, and properly maintained, the natural hemostatics will be much favored, and very probably little or no blood will escape from the torn vessels. Ecchymosis having occurred, the nature of the application must vary according to the presence or not of inflammatory action in the part; in the one case, fomentation is employed, subjugation of the morbid vascular action being the paramount indication; in the other, a solution of the muriate of ammonia, or other sorbefacient, is applied, in order to hasten removal of the extravasated blood by absorption.

Wounds of the eyelids, if contused, are treated by the water-dressing. If incised, approximation is effected by fine sutures; other retentive means being plainly inapplicable to this locality. Great care should be taken to restore the normal relative position with accuracy, lest deformity ensue.

In the case of burns, much precaution is required during the process of healing, lest by contraction *ectropion* supervene; and the careful dressing and bandaging necessary for this purpose is continued even for some time after the parts have healed.

Foreign Bodies.

Foreign bodies of small size, as particles of sand, dust, glass, coal, very frequently lodge in the eyelids, on their conjunctival lining. The patient, suffering much pain and irritation, with the eye already red, intolerant of light, and profusely lachrymating, applies for our aid on account of "something in his eye." Gently opening the eyelids, before a steady light, we scrutinize the eyeball in the first place; directing the

patient to roll the organ in various directions, in order to facilitate such examination. If particles are found adherent, they are, in general, easily removed, by a curette, or flat end of a probe; by a hair-pencil, or by a fold of a soft handkerchief. If fine dust only have lodged, fomentation and ablution will ordinarily suffice, assisting the lachrymation in its spontaneous cleansing effort. Sometimes it may be necessary to inject a gentle stream of tepid water, by means of a small syringe. In other cases, it is enough to shut the eye, or keep it shut, for a few minutes, occasionally blowing the nose; thus favoring the natural washing away of the foreign particles, by increased lachrymal and conjunctival secretion. The eyeball having been duly scanned, the lower eyelid is next examined; its conjunctival lining being readily exposed to a sufficient extent, by simple depression of the part. But the upper eyelid is the site most frequently occupied by the foreign substance, and it cannot be sufficiently exposed without eversion. This is effected by placing a probe horizontally across the lid, above its cartilage; taking hold of the eyelashes with the finger and thumb, and bending the eyelid backwards over the probe. If the foreign matter be loose, it is removed by any of the means already mentioned. If it be firmly lodged, the point of a toothpick, or of a couching-needle, will most conveniently effect its dislodgement.

In certain occupations, particles of steel or iron are apt to get between the eyelids, and often become impacted in the cornea. When loose, they may sometimes be brought to the surface and removed by means of a magnet of strong power, but, generally, the point of a couching-needle is required to effect their detachment.

When no assistance is at hand, the patient may, himself, in many cases, get rid of the irritating matter, by elevating the upper eyelid with the fingers of one hand, and pulling it downwards, while he at the same time closes the lower, and pushes it upwards. Having pressed gently over the globe, the finger is then withdrawn, and the lids allowed to separate. The eyelashes of the lower lid are thus made to sweep the conjunctival lining of the upper; and, it is in the latter situation, as already stated, that foreign bodies of small size usually lodge.

The foreign body having been removed, the eye is closed; light is excluded; and antiphlogistics are employed according to circumstances. It is plain that if the foreign substance be not removed, inflammatory action will certainly be established, and probably prove untoward and intractable. Cases are not wanting in which complete destruction of vision has been the ultimate result of but a small particle of foreign matter lodging in the conjunctival lining of an eyelid; perhaps with much injury done to the system by severe and sustained treatment directed against the inflammatory action and its results.[1]

Blepharitis.

The inflammatory process, attacking the eyelids, is so named. It may follow injury; assuming the ordinary character and course, and amenable to the ordinary treatment.

[1] Lancet, No. 1061, p. 485. One among many.

In erysipelas of the face, affection of the eyelids is usually a most prominent symptom; the laxity of their areolar tissue admitting of much and unseemly swelling. Punctures are usually necessary, not so much to abstract blood as to evacuate serous effusion. After recession of the primary symptoms, this part must be closely watched; for, during convalescence, reaccession of inflammatory action is very apt to occur, advancing rapidly to suppuration (*Principles*, 3d Am. Ed. p. 210); and, unless an early incision be made here, the abscess will be large, and the integument will probably slough.

Ophthalmia Tarsi.

By this is meant a congestion, or chronic inflammatory process, affecting the eyelids, more especially at their margins. The Meibomian follicles are prominently affected, and a viscous, disordered secretion adheres to the parts, tending to cause cohesion of the ciliary margins. More or less lachrymation, in general, exists. The eyelashes are stunted, or deficient. Itching, heat, and intolerance of light are usually present, and the general expression is bleared and unpleasant.

The disease will usually be found coexistent with some vitiated condition of the general system, and to that the treatment must be mainly directed. Not unfrequently, the constitutional vice will be found of the scrofulous character. If pain, heat, redness, and other ordinary characteristics of the inflammatory process exist at all prominently, blood is to be taken sparingly from the part, by scarification of the conjunctiva or by leeches at the inner canthus. For a few days afterwards, fomentations, medicated or not, are to be applied. Then stimulants are used, such as solutions of zinc, or nitrate of silver, or the ung. nitratis hydrargyri diluted. In obstinate cases, counter-irritation is sometimes useful, and this is best effected by the application of blisters behind the ears. In children, the state of the gums and teeth must be looked to.

An advanced form of this chronic affection of the eyelids is sometimes termed *Lippitudo*. The ciliary margins are red, thickened, everted, and denuded of hair, and the eye seems to be surrounded by an angry red circle. The general expression is consequently very unpleasing, and the patient's discomfort is also great. Local and general alteratives are pre-eminently required, but they often fail to prove quite satisfactory. Stimulants applied to the parts are useful, such as pencilling the lids with a solution of nitrate of silver, and the like.

Not unfrequently, ophthalmia tarsi is but a part of a more general affection of the eye, of a strumous character.

Hordeolum, and other Swellings.

By Hordeolum, or *Stye*, is meant a circumscribed inflammatory swelling, which may either remain of an indolent and indurated character or advance to suppuration. In the latter case, discharge of matter takes place, and discussion slowly follows. Very frequently the affection originates in a Meibomian follicle, and resembles an ordinary pimple. The follicle is obstructed, and its contents accumulate; an inflammatory process is then kindled in the perverted part, suppuration takes

place, and the enlarged follicle becomes the seat of a small acute abscess.

Here, too, the general health will be found amiss, and purgatives, alteratives, with regulation of diet will probably be required. While the swelling is nascent, fomentation and light poultices, or water-dressing are suitable. When matter has formed, a puncture should be made at the apex of the swelling for efficient discharge, and then water-dressing is again applied. If a chronic hardness should threaten to remain, discussion of this will be promoted by pencilling the part lightly over with a solution of iodine or nitrate of silver.

An inflammatory swelling, similar to the true hordeolum, may form in the ordinary areolar tissue of the eyelid, resembling a small furunculus. It is amenable to ordinary treatment.

Small, hard swellings, of a whitish color, very superficial, painless, and almost stationary, occasionally form beneath the integument of the eyelid. According to their size, they are termed either *Grando* or *Milium*, according as they most resemble a piece of hail or a millet-seed. Causing deformity, they require removal. A scratch is made through the thin skin stretched over them, and the white pearly-looking substance is squeezed out. No escharotic is necessary. The wound scarcely bleeds, and heals simply.

Warts sometimes form on the eyelids. They may be taken away by scissors, ligature, or caustic.

Encysted Tumors of the Eyelids.

Encysted tumors are of frequent occurrence in this situation, more especially in the upper lid. They are usually of small size, the contents are white and glairy, the cyst is extremely delicate. Their site may be either subcutaneous or submucous, on the conjunctival or on the external aspect of the tarsal cartilage. The majority of the patients are of the female sex.

Fig. 18.

Encysted Tumor of the Lower Eyelid. The lid inverted.

Removal by regular dissection need not be attempted, the cyst is too delicate. And for the same reason, incision, with evulsion of the cyst, is inapplicable. It is sufficient, in many cases, to incise the part, to squeeze out the contents, and with the point of a probe to disturb and break up the tender cyst. But, in some cases, it is well to apply an escharotic, so as to insure the cyst's destruction, and consequent non-reproduction of the tumor. The nitrate of silver is very suitable, escharotic enough to annihilate the cyst, and not likely to cause such loss of substance as would delay the cure, extend the cicatrix unnecessarily, or risk the occurrence of either inversion or eversion of the lid by contraction of the cicatrix. Incision is facilitated by effecting previous tension of the part. This is done by simply stretching the skin over the swelling, and cutting through the attenuated integument, taking care to make the incision in a direction parallel to the fibres of the orbicularis muscle, or by everting the lid (p. 92), and then cutting

through the stretched and prominent mucous membrane. Either form of procedure is the preferable, according as the site of the tumor happens to be subcutaneous or subconjunctival.

Hypertrophy of the Upper Eyelid.

The upper eyelid is occasionally affected by hypertrophy of both its integument and mucous membrane. The swelling is considerable, and causes deformity; it also obstructs vision, and there is an unpleasant puriform discharge.

By two elliptical incisions, a sufficiency of the diseased integumental texture is removed, and the wound is approximated by suture. The conjunctival change is subsequently remedied by scarification, followed by the use of sorbefacients. Or, should the conjunctiva resist this gentler means, partial ablation of it may be practised, as in the case of the integument.[1]

Cancer of the Eyelids.

Malignant ulceration is usually preceded in the eyelids, by warty formation. The only cure is by excision, early and free. If the disease be limited, sufficient removal may be effected, yet without deformity or exposure of the eyeball, the wound being so shaped as to come well together by suture. But when the disease is extensive, and an operation warrantable, the prevention of deformity need not enter into our thoughts. One paramount indication is present, removal of all the diseased part. That must be effected, at whatever sacrifice of texture. When it is found necessary to remove the whole or greater part of the eyelids, more especially the upper, on account of malignant ulcer, it comes to be a question whether or not it be politic to spare the eyeball, supposing it to be apparently sound. Some writers recommend its removal at once, considering that the organ, being deprived of its natural protection, will be destroyed by inflammation. This, however, is not always the case. It is better to wait till this event has actually taken place, and then to induce collapse of the globe, by puncturing the cornea, and allowing the humors to escape; this is more safe and simple than immediate extirpation, and equally efficient.

Intractable ulcers of the eyelids, not malignant, are best treated by regard to the state of the system, more especially of the digestive organs, and by occasionally touching the parts with the fluid nitrate of mercury or nitric acid. Sometimes they are of a syphilitic character, obviously dependent mainly for cure on constitutional treatment.

Closure of the Eyelids.

By the term *Anchyloblepharon*, is understood union of the eyelids at their tarsal margins, congenital, or accidental, the result of cicatrization after burn or scald. When congenital, the cohesion is seldom to a great extent, occupying only the angles. No interference may be deemed

[1] Liston, Lancet, No. 1089, p. 489.

necessary. When more extensive, causing not only an unseemly deformity, but likewise interfering with vision, separation of the preternaturally united parts may be readily effected by incision. Afterwards, all necessary means should be taken to prevent reunion, each lip of the wound being made to cicatrize separately by granulation. When the closure is complete, a circumstance of rare occurrence, a fold of the parts should be first raised from the ball, and cut through in a horizontal direction; through this aperture a director is carefully introduced, and on it the subsequent division of the angles is safely effected. The accidental form is amenable to similar treatment. But greater care is necessary, in the after management, to avoid reunion. This is prevented by the interposition of dressing, frequent movement of the parts, and if necessary by forcible separation of the lids by plaster, and the application of some gently astringent lotion.

By *Symblepharon*, is meant adhesion of the eyelids to the eyeball, seldom congenital, usually the result of cicatrization after injury. In some cases, the cicatrix is dense and contracted, admitting of no attempt at cure. In others, the adhesions are comparatively slight, and there is sufficient laxity of texture. In these latter, the lids are to be liberated by careful dissection, their separate cicatrization being afterwards carefully attended to. Reunion is much more liable to take place in symblepharon than in anchyloblepharon, and is best prevented by frequent motion of the eye, by proper dressing, and by the occasional introduction of a probe to separate the new adhesions. The temporary insertion of an artificial eye has been suggested, but even the most persevering exertions have often proved unsuccessful.

[Probably the most successful plan of operating will be found to be that of Von Ammon. He surrounds the base of the connecting band, at the point of its attachment to the lid, by an elliptical incision which penetrates through the lid; the sides of the incision converge towards the skin, so that the band is thereby cut loose from the lid, and rests between the latter and the globe of the eye. The edges of the wound are now approximated by means of fine sutures; and after union of the gap has taken place, the band is severed by scissors from its attachment to the conjunctiva of the eyeball.

Mr. Walton, in his recent publication on *Operative Ophthalmic Surgery*, reports two successful cases treated by incisions upon the lid and the conjunctiva of the globe, made in the same way, and treated subsequently, as in Von Ammon's operation just described.—Ed.]

Lagophthalmos.

Lagophthalmos, or Hare-eye, means an inability to close the eyelids; and the eye, being deprived of its natural protection, is exposed to the action of the air and other external irritants, which may cause inflammation of the conjunctiva, eventually terminating in opacity of the cornea. The disease often results from paralysis of the orbicularis muscle; more frequently it is caused by retraction or shortening of the lid, arising from contraction following abscess, or burns and other injuries. Sometimes it proceeds from cold or other causes acting upon the facial nerve in its transit or distribution.

The treatment varies according to the cause. When the affection arises from paralysis, blisters, friction, electricity and strychnia are appropriate; when from retraction of the lid, division of the cicatrix may be of use; and when from affection of the facial nerve, leeches, blisters, and stimulants in the course of the nerve are to be employed. When it is caused by cerebral congestion, antiphlogistic remedies are to be had recourse to.

Ptosis.

Ptosis is a falling downwards of the upper eyelid, producing no inconsiderable deformity, and seriously interfering with vision. It may constitute a disease of itself; or it may be but a symptom of serious affection of the brain. When original, it may depend on debility of the elevating muscle, or on superfluity or thickening of the integument; or it may be connected with both of these circumstances.

Redundancy of integument is easily got rid of by removing a sufficient portion, either by knife or by scissors. Atony of the muscle may be overcome by stimulant frictions, the passing of electricity or the endermic use of strychnia. Ordinary means having failed, an operation may be had recourse to. A large portion of integument is removed from the eyelid, and also from a corresponding portion of the eyebrow; the two raw surfaces are then brought into apposition by suture, and when union has taken place the lid will be elevated by the action of the occipito-frontalis muscle, to such an extent as to admit of useful vision.

In the secondary form, dependent on affection of the brain, treatment must of course be directed to the cerebral disease.

Trichiasis, and Distichiasis.

Trichiasis denotes inversion of the eyelashes, whereby much irritation is induced on the surface of the eyeball. The inversion may implicate the whole cilia, or only a few. It may occur in either lid, but is most frequent in the upper. The position of the eyelid itself is not altered. At first, there is merely inconvenience; but, sooner or later, an inflammatory process is established on the surface of the eyeball, and consequent danger to vision may prove great.

Treatment is either palliative or radical. The former consists in evulsion of the erring cilia, from time to time, and mitigation of the irritation and inflammatory action which they may have occasioned. For evulsion, a pair of broad-pointed forceps, with their opposing surfaces in accurate contact, are required, for the hairs are usually both slender and light-colored, and the assistance of a lens is often necessary. This method is, on the whole, unsatisfactory, and is only applicable to those cases in which but a few of the cilia are in fault.

To effect a radical cure, it is essential that the lashes be not only removed, but that their non-reproduction shall be insured. One of two methods may be followed. The errant cilia may be plucked out, and their bulbs destroyed; or the bulbs and cilia both may be removed by cutting instruments. The former method is applicable to the partial

trichiasis; the latter to the complete. If the former be chosen, an incision is made with the point of a lancet, on the free margin of the lid, down to the roots of the inverted cilia; into this little opening, a needle, or another lancet, coated with powdered tartrate of antimony, is inserted, allowing it to remain so that its coating may dissolve there; and the hairs are then pulled out. A small pustule forms, and the bulbs are destroyed.[1]

When it is our object to remove not only the cilia, but their bulbs, a horn spatula is introduced beneath the lid, an incision is made down to the tarsus along the whole length of the inverted portion, parallel to, and about a line from the ciliary margin, to which it is to be connected at each extremity; the ciliary edge is then to be laid hold of with the forceps, and the integuments carefully dissected from the cartilage, so as to include the bulbs without interfering with the mucous edge of the lid. When the part cicatrizes, little deformity will result. Or, the margin of the lid is laid hold of, and stretched by the fingers of the left hand, or by forceps; and, by the stroke of scissors, or the sweep of a fine bistoury, the requisite amount is taken away. By operating in this way, more deformity will be produced than by the former plan; but, by either, the eyeball will be freed from a continual source of irritation.

By *Distichiasis*, is understood a row of supernumerary cilia, growing inwards, and causing the same unpleasant and untoward results as the foregoing affection. The same treatment is required as for trichiasis. But more careful examination is expedient, inasmuch as the observer is apt to be deceived by seeing the ordinary eyelashes of their normal character; and, even when the lid is raised and scrutinized, the paucity, slimness, and paleness of the stray lashes may often cause them to be overlooked—a serious matter—for, unless they be noticed and removed, inflammatory action will not only become established, but will prove uncontrollable. To detect them readily, the lid should be inspected laterally, as well as in front, and the patient should be desired to turn his eye in different directions, so as to form a dark background of the iris and pupil.

Entropion.

This is a turning in, not only of the eyelashes, but of the margin of the eyelid itself, attended with all the unpleasant consequences of trichiasis, in an aggravated form. It may be temporary or permanent. In the former case, it is the result of inflammatory swelling of the eyelid; "the tumefied conjunctiva pressing out the orbital edge of the tarsus, while its ciliary margin is turned inwards by the action of the orbicularis."[2] When permanent, it may depend on relaxation of the integument of the lid, whereby displacement inwards of the ciliary margin

Fig 19.

Entropion, affecting both eyelids.

[1] Edinburgh Monthly Journal, April, 1841, p. 259.
[2] Littell, on Diseases of the Eye, p. 95.

lid and the globe. This action of sulphuric acid causes, in general, exquisite pain, and is only applicable to cases where the patient will not submit to an operation by sharp instruments.

When the disease is dependent on a perverted state of the ciliary margin and tarsal cartilage, one of two methods may be adopted. The cilia and their bulbs may be removed, as for trichiasis; care being taken to leave the puncta lachrymalia intact. Or, by such an operation as the following, an attempt may be made, retaining the eyelashes, to liberate and restore them to their normal position. "The patient having been placed in a sitting posture, and the head supported by an assistant, the inverted lid is separated from the globe of the eye by means of the finger or a sharp hook; and then, with a pair of strong scissors, two perpendicular incisions are made through the tarsal cartilage, each about a quarter of an inch in length, the one upon the temporal, the other upon the nasal side, avoiding the punctum, and including the whole inverted portion of the lid. This part being now everted, and held in that position, the two perpendicular incisions are connected by a horizontal incision upon the conjunctival surface, close to the ciliary margin, by means of a scalpel; cutting through the conjunctiva and tarsal cartilage, and leaving the inverted portion of the margin united to the rest of the lid merely by the integument. And especial care is taken that the knife does not penetrate through the skin." Water-dressing is applied. And "the success of this operation depends in a great measure on the edges of the incision being prevented from uniting by the first intention, particularly the horizontal incision upon the conjunctival surface. This is effected by everting the lid occasionally during the first few days, and by touching the edges immediately after the operation with the sulphate of copper, so as to cause them to suppurate and heal by granulation.[1] Mr. Crampton's operation for entropion consists in making a perpendicular section of the lid, with scissors, at each canthus, from a quarter to half an inch long; taking care not to wound the punctum. An elliptical portion of skin is then removed from the outer surface of the lid. Two or three ligatures having been introduced through the skin at the tarsal margin, the eyelid is everted by means of them, and drawn up towards the eyebrow; in which position it is retained for a few days, by the ligatures being fixed to the forehead with a strip of adhesive plaster. In the mean time, the exposed mucous membrane is covered with a piece of wetted lint; and as the perpendicular incisions heal by granulation, a sufficient degree of eversion will be produced.

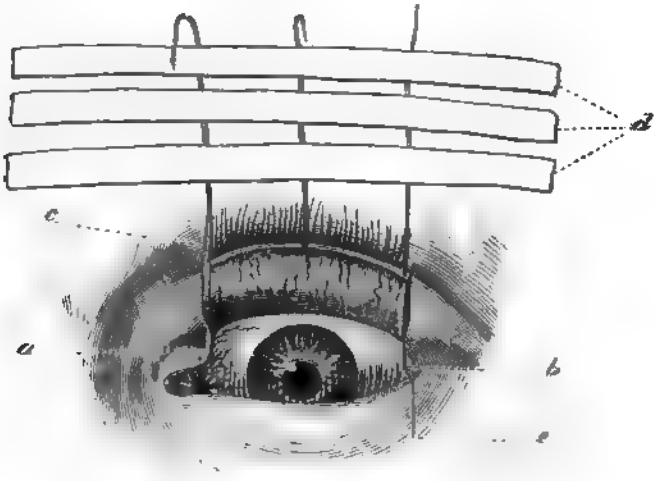
[Mr. Crampton's operation and that of Mr. Guthrie are here confounded and blended. The former consists in dividing the tarsal cartilage by two perpendicular incisions, each about three lines long, in the manner described in the text; next, to overcome the supposed contracted state of the conjunctiva, a transverse division of this membrane is to be made, uniting the extremities of the first sections; and the lid, now easily everted, is to be maintained in this rectified position by a suspensorium palpebrarum, until union of the edges of the wounds has taken place.

[1] Dublin Medical Press, July 27, 1842, p. 54.

Mr. Guthrie, finding that this method did not always succeed, modified it as follows: He made the perpendicular incisions as did Mr. Crampton, but rather more freely, from a quarter to a half inch, "until that part of the eyelid containing the tarsal cartilage is perfectly free, and is evidently not acted upon by the fibres of the orbicularis muscle, which lie upon it." If any vicious curvature of the tarsal cartilage can be detected, by which the everting effect of the first incisions is counteracted, it must now be divided in its length, exactly at the place where it is bent, which is generally at its inner part. The portion thus slit is only connected with the common integuments of the lid; this incision need not exceed one-eighth of an inch at each extremity, and is usually requisite only at the inner. The next step consists in removing a fold of the skin from the length of the eyelid, as close as possible to its margin, between the perpendicular incisions, and in uniting the edges of this wound carefully by three or four fine sutures, which are now also passed through the edge of the lid and finally secured upon the forehead by strips of sticking-plaster. The perpendicular incisions are not to be permitted to close by first intention, but lunar caustic or sulphate of copper is to be applied to them from time to time, so that they may be made to granulate. Mr. Guthrie objects to the transverse incision of Mr. Crampton, as being not only unnecessary but injurious.

In entropium of *the lower* lid, Mr. Guthrie generally finds it necessary to divide the tarsal cartilage only at its outer angle, and to evert the lid as in the case of the upper; in very inveterate cases, however, a similar division is made at the inner extremity also, avoiding the punctum; union by granulation is insisted upon, as in the operation on the upper lid.[1]

Fig. 20.



[Mr. Guthrie's operation.—*a*, *b*. The perpendicular incisions. *c*. The ligatures supporting the lids. *d*. The confining strips. *e*. Line of incision in a case of inversion of the lower lid. (From Lawrence, Am. Ed.)—Ed.]

[1] [Operative Surgery of the Eye, p. 80, &c.]

The accompanying figure, copied from Mr. Guthrie's book, exhibits a view of this operation.

In a very interesting paper on Entropium, published in the *Dublin Medical Journal*, for March, 1844, Mr. Wilde recommends an operation for it, which differs from that advised by Professor Miller for trichiasis, only in the fact that, after the excision of the cilia and their bulbs, the edge of the mucous membrane, which has been carefully preserved untouched by the knife, is nicely united by fine sutures with that of the skin, so that union by first intention, instead of by granulation, is secured.

Mr. Haynes Walton, in a very recent work on "Operative Ophthalmic Surgery," in which he appears to have diligently investigated the causes of this troublesome affection, contends with good reasons that it is due not to any faulty condition of the skin, conjunctiva, or tarsal cartilage, but to vitiated action of the *orbicularis muscle;* and his indications of treatment are, "to overcome the means of the inversion by dissecting away the thick marginal portions of the orbicularis, supposing that part of the muscle to be entirely or nearly all that is at fault; and also to remove as much of the skin of the lid as may be necessary to produce such tension as shall overcome the deformity which other tissues of the lid may have acquired, from the irregular position into which they have been thrown by the muscles, and which has been made more or less permanent by the changes induced by inflammation," (p. 164.) Accordingly, he dissects from the tarsal margin of the lid an elliptical portion of the integument and orbicular muscle, extending along the entire length of the lid, from as close as possible to its edge as far backwards as may be necessary, and then unites the edges of the wound by three or four fine sutures, applying subsequently the cold water-dressing.

Mr. Walton's chapter on this subject is a very instructive one; the text is elucidated by numerous drawings.—Ed.]

Mr. Tyrrell recommended that the lid should be merely divided at its centre by a single perpendicular incision. The pressure caused by the contracted cartilage was thus relieved; and as the wound, shaped like an inverted Λ, became filled by granulations, very little deformity would result. Both this and Mr. Crampton's operation are only applicable to cases where the disease arises from a contracted state of the cartilage.

Ectropion.

Ectropion denotes an opposite condition of the eyelid—its eversion; and is more frequently met with in the lower, than in the upper lid. The conjunctival lining is exposed, the eyeball is partially denuded, and much deformity is produced. After a time, the exposed palpebral conjunctiva loses much of its membranous character; the surface of the eyeball becomes irritable, inflames, and undergoes change of structure—probably fatal to vision; and a degree of epiphora invariably

Fig. 21.

Ectropion, affecting the upper eyelid: the result of exfoliation.

exists, in consequence of the natural course of the lachrymal secretion towards the puncta being interrupted. The malposition most frequently results from contraction of cicatrices of the integument; and these may exist in the eyelid or its immediate vicinity, in the corresponding cheek, or extensively on the face and neck as after severe burns (*Principles*, 3d Am. Ed. p. 642). The lower eyelid is the more frequently affected. The cicatrix may follow a burn, wound, sloughing abscess, or exfoliation; the first and last are the most unfavorable.

Ectropion, however, arises from other causes than the contraction of sores. Simple relaxation of the lower lid will produce it; and this may depend on flabbiness and redundancy of all the component textures, or on atony only of the fibres of the orbicularis. The last circumstance is no uncommon occurrence in old people. Frequently, ectropion is caused by a faulty condition of the conjunctival lining of the lid, which is the seat of swelling, of either an acute or chronic kind. And it is well to remember, how general inflammatory swelling of the lid is able to cause either inversion or eversion, according to the accident of displacement; just as a similar condition of the prepuce may be the cause either of phymosis or of paraphymosis. Eversion is no uncommon attendant on purulent ophthalmia; from the acute and great swelling of the lid, more especially of its conjunctival lining. It also results from an indolent enlargement and thickening of that membrane. The accidental division of either canthus, too, may cause it; the lid becoming loose and pendulous. Or it may arise from an elongated and irregular state of the tarsal cartilage.

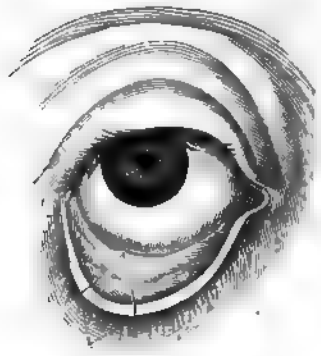
Fig. 22.

Ectropion, affecting the lower eyelid.

Treatment necessarily varies according to the nature of the cause. Acute swelling of the eyelid and its lining is subdued by the usual means. Chronic enlargement of the membrane is first treated by scarification, and astringents. If these be resisted, the redundancy may be removed, either by curved scissors or by caustic; the former obviously to be preferred; great care being taken lest, by the removal of too much, entropion be produced. Atony or paralysis of the fibres of the orbicularis may be combated by the usual means; but, generally, this form of the affection, occurring in those of advanced years, may be regarded simply as one of the many signs of decay, and irremediable. When there is elongation of the tarsal cartilage, or redundancy of the whole lid, abbreviation, sufficient to restore normal position, is effected by a simple operation. Towards the centre of the lid, a triangular portion of its whole thickness is to be removed in the form of the letter V; the margins of the wound are brought together by suture, a proper compress is applied, and when the parts heal the lid will be in close apposition to the globe. (See Fig. 23.) In the case of faulty cicatrices, the procedure is more difficult and less promising. Occasionally, the simple division of a tight adhesion may suffice for liberation and replacement. But generally, there is loss of substance connected with the cicatrix, and consequently simple incision proves inadequate.

In the case of a moderate cicatrix, at some distance from the ciliary margin, amendment, if not complete restoration, may be effected as follows: Supposing the lower eyelid to be affected, a V wound is made, through the integument only, the apex pointing to the cheek. By means of the knife's point, the included skin is freed a little from its areolar connections; and resilience upwards is favored by the necessary manipulation. Displacement upwards is then definitely secured by bringing together laterally the wound that remains beneath, by means of sutures. In not a few cases there is not sufficient laxity of parts to admit of this. Under such circumstances, something may be done by incising the eyelid, and replacing its ciliary margin; then filling up the chasm beneath, which necessarily results, by a flap of integument borrowed from the adjoining cheek. When ectropion has resulted from accidental wound at the canthus, rectification is easily obtained by reunion of the divided parts; the margins of the cicatrized wound being made raw by paring, and retained in accurate apposition by suture.

Fig. 23.



[Plan of this operation. (From Lawrence, Am. Ed. —Ed.]

Fig. 24.

Plan of this operation; the dotted line marking the original wound; the plain line representing the flap of skin in its new and elevated position.

[So many operations have been devised to suit particular cases of Ectropium, that it would be out of place to describe them all in a general treatise like this. The reader is, therefore, referred to special works on diseases of the eye, and particularly to the American edition of Mr. Lawrence's book, where a great variety of proceedings are enumerated and illustrated.—Ed.]

Blepharoplastics.

When either eyelid has been partially or totally destroyed, by injury, or by disease not of a malignant kind, an attempt may be made not without good prospect of success, to supply the deficiency by a suitable flap brought from the immediate vicinity. No precise rules can be given for such an operation; the details must necessarily vary in each case.[1]

[1] London and Edinburgh Monthly Journal, 1843, p. 359. Cyclopædia of Practical Surgery. *Sub voce.*

III. Affections of the Lachrymal Apparatus.

Epiphora. Stillicidium.

Epiphora consists in an increased secretion of tears, which flow over the cheek. *Stillicidium lachrymarum* depends on some affection of the excreting lachrymatory apparatus, which prevents them from taking up the tears as they are secreted.

The watery eye may be either congenital, or the result of injury or disease. It is best treated by means of astringent collyria; by weak solutions of nitrate of silver, or wine of opium, dropped upon the eye once a day; or by exposing the eye to the vapor of laudanum; and by using at the same time some weak red precipitate ointment to the edges of the lids at night, when there is any derangement of the Meibomian secretion.

In all cases, not prominently connected with some more important affection of the eye, the state of the general system must be carefully looked to; for it is extremely probable that no slight declension from health will be found; and, unless this be remedied, all local treatment will prove of comparatively little avail. When a watery eye results from a contracted state of the puncta, these are to be dilated by means of fine probes, or a stiff bristle. When there is relaxation or atony of the lachrymal sac, then stimulating injections or collyria are to be used. These are thrown into the sac by means of Anel's syringe, through the punctum. Occasionally, a small blister applied over the sac is of use. When the nasal duct is obstructed, measures must be taken to effect its clearance. Often, the watery eye is but a symptom of general ophthalmia, and is only to be cured by its subjugation.

Xeroma denotes an opposite condition; a dryness of the eye, dependent on deficiency of the lachrymal secretion. Frequently, it is a temporary prelude to graver affections of the eye, of an inflammatory nature. When it occurs singly, and persists—as is but seldom—restoration of the secretion is to be courted by ordinary stimulant means.

Inflammatory Affections of the Lachrymal Sac.

The *areolar tissue over the lachrymal sac* sometimes is the seat of an inflammatory process; while, in the first instance, the sac itself is free. A red, itchy, painful swelling exists at the corner of the eye; and the system sympathizes slightly. The cause usually is exposure to cold. Purging, and antimonials internally, with low diet, and pencilling of the affected part with nitrate of silver, or tincture of iodine, will ordinarily suffice to obtain resolution. If they fail, then local depletion by leeching must be had recourse to; the leeches being applied over the part itself. It is obviously of much importance to be early and active in such treatment; so as, if possible, to prevent involvement of the lachrymal sac. If suppuration should occur, a very early incision should be practised, lest perforation of the sac take place. Not unfrequently, notwithstanding every precaution, the sac is involved, and suppurates

acutely. The same treatment is necessary; an early evacuating incision, or enlargement of the spontaneous opening, and light water-dressing afterwards. The opening granulates and heals; and usually the breach in the sac closes, leaving its cavity unoccluded.

The *lachrymal sac* may itself be the primary seat of acute inflammation. This may occur idiopathically in those of weak system, or in any one, after exposure to cold. A small, hard, circumscribed, and very painful swelling is formed below the tendon of the orbicularis muscle; the superimposed integuments soon become red, the eyelids are more or or less œdematous, the corresponding side of the nostril is dry; and the system sympathizes considerably. The swelling increases, often almost obscuring the eye; and severe headache usually is complained of. The course of the tears is obstructed, by the tumid state of the duct's lining membrane—inflammation having extended to it—and they find their way over the cheeks. Suppuration occurs, and, sooner or later, the matter is discharged externally. Then a slow recovery may ensue, the nasal duct becomes again open, the tears resume their proper course, the suppurated aperture granulates and heals. Or the obstruction in the nasal duct remains, the tears do not reach their wonted outlet, the aperture contracts but does not heal, and the condition of fistula lachrymalis is established. In severe and neglected cases—more especially if occurring in a debilitated frame—the subjacent periosteum may be destructively involved, and tedious exfoliation ensue.

Antiphlogistics are obviously demanded here; leeches over the inflamed sac, warm anodyne fomentations, and a full dose of morphia at night, to allay pain and procure rest. These ought to be used early to avert suppuration if possible. When matter has formed, it must be evacuated at once. This is done by introducing a bistoury into the sac, below the tendon of the orbicularis, which ought to be rendered prominent by drawing the lids outward. After evacuation, light water-dressing or poultice is applied; and the sac, after a time, may be occasionally syringed with warm water. We hope that the membrane of the duct will duly recover from its tumid state, that the natural course of the lachrymal fluids will be restored, and that the outward opening in the sac will close.

A chronic affection of the lachrymal sac is not uncommon; the vascular process reaching no higher than congestion, and limited almost entirely to the lining membranes. An indolent swelling occurs beneath the tendon of the orbicularis, soft, fluctuating, comparatively painless, and capable of being emptied by pressure; for the puncta remain open, and through them the puriform secretion escapes upwards. The passage downwards is obstructed; and, indeed, this circumstance seems, in most cases, to be the origin of the malady.

Sometimes this chronic distension of the sac is the result of an acute or subacute attack. In other cases, it is chronic from the first; and, in these, the state of the general system is usually unsatisfactory. There is a constant liability to acute accession from but slight causes; and, when such an aggravation does occur, the progress is likely to be rapid and untoward. Suppuration and outward discharge take place, and fistula lachrymalis is established, perhaps with necrosis of the os unguis.

Treatment consists in prophylactic care, so as to avert such untoward events; in attention to the general health; in maintaining a comparatively empty state of the sac, by occasional pressure; and in the use of stimulant injections, collyria, or ointments. Sometimes vesication over the sac, by nitrate of silver, or tincture of iodine, is of use; at other times, the application of a few leeches will prove serviceable.

It is in such cases that Anel's syringe is of most use; to clear out accumulated discharge, and to convey alterative and stimulating fluids to the congested membrane. For overcoming structural obstruction in the nasal duct, any such injection is quite inadequate.

Fistula Lachrymalis.

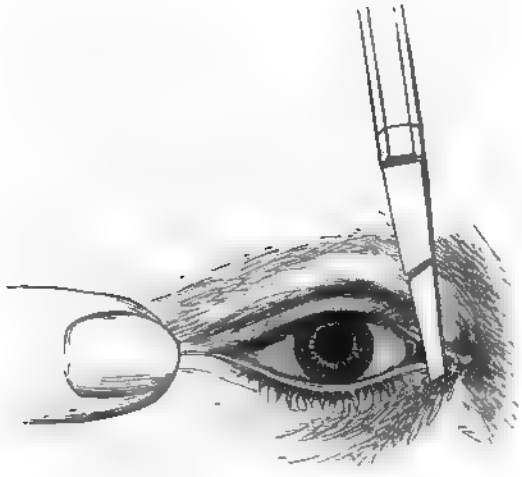
How this condition is produced, has already been explained. Obstruction takes place in the nasal duct; the lachrymal sac inflames, suppurates, and ulcerates—the ulcerated aperture discharging externally; and the wound, only contracting, does not heal. This train of events may originate in the lachrymal passages, and usually does so. But the origin may be in the subcutaneous areolar tissue, as already stated; or in the bone and periosteum, in those with a mercurio-syphilitic taint of system. The greater number of cases, however, are of a simple nature; originating in the lachrymal passages, and involving the deeper parts secondarily, if at all.

Fig. 25.

Fistula Lachrymalis. The chronic stage established; and the aperture small.

The essential parts of the disease are, obstruction in the nasal duct, and an external opening in the lachrymal sac. In treatment, it is our

Fig. 26.



[View of operation for fistula lachrymalis, from Lawrence, Am. Edit.—Ed.]

object to close the latter; and that can be done only by removing the former. To this end, an operation is necessary. The patient having been seen seated on a chair, with the head supported, a narrow, sharp-pointed, straight bistoury is inserted into the fistulous opening beneath the orbicularis tendon; and is not only lodged in the sac, but pushed into the osseous nasal canal as well. To accomplish this dexterously, reference to the anatomy of the parts is necessary, in order that the penetrating instrument may receive the requisite direction; downwards, a little backwards, and a very little inwards. By the side of the bistoury a stout probe is passed down; and, as the former is slowly withdrawn, the latter is pushed steadily onwards, until it has overcome the obstruction, and is felt to touch the floor of the nostril. To effect this perforation, a little force is sometimes necessary. A few drops of blood, escaping by the nostril, prove re-establishment of the duct complete; also, if the patient be made to expire forcibly, while the nostrils are shut, air and bloody mucus will be ejected upwards through the duct, if the probe have been withdrawn. (See Fig. 26.)

But it is not enough that the knife and probe procure a temporary re-establishment of the canal. This must be kept permanently open; and, to accomplish this, *styles*, or small bougies, are employed, of various sizes, and made of silver. One, about the thickness of an ordinary probe, and sufficiently long to reach from the upper wound to the nasal aperture of the duct, is lodged in the canal; its flattened head resting on the integument. No fixed size can be defined as generally suitable for the commencement of the treatment. It is enough if the style pass easily after withdrawal of the ordinary probe. Having been lodged, it is allowed to remain. After some hours, the usual resenting of the presence of a foreign body is evinced. The part becomes hot, painful, and swollen; still, the exciting cause is not to be removed; the style is left untouched. Fomentation, or a poultice, and the minor general antiphlogistics are employed; and, usually, after a day or two, the inflammatory signs subside, the style feels loose again in its site, and a purulent discharge escapes freely by it. After a few days of quietude, the original style is withdrawn, and one a size larger gently substituted. This, in its turn, gives place to a third; and so on, until one is passed of sufficient bulk completely to occupy the canal; the passage being syringed once a day with tepid water, to keep it clean. This last style is worn for some considerable time, until there is good reason to suppose that the normal caliber of the passage is fully restored, and that its lining membrane has returned to a tolerably sound condition. Then the instrument, which had only been taken out occasionally, for the purpose of being cleaned and replaced, is withdrawn, and a smaller substituted. This, after having been worn for some days, is succeeded by a less; and by this gradual abstraction of the stimulus, relapse is rendered improbable. Then, if the tears continue to flow naturally, and all else seem favorable, the use of the instrument may be wholly abandoned; and the external aperture, now much contracted, may be permitted and encouraged to

Fig. 27.

Style for the Lachrymal Duct.

close entirely. Frequently, no aid is necessary to secure this latter event. But, should a small fistula threaten to prove obstinate, the touch of a heated wire, or point of caustic, will usually effect its contraction and closure.

At one time, tubes were employed instead of styles. Experience, however, has declared them to be inferior. They create the same disturbance in the part, are apt to become obstructed, equally require occasional removal; and, in some cases, their attempted removal has been attended with the utmost difficulty.

At one time, also, it was no uncommon practice to seek a more direct road to the nasal outlet, than through the obstructed lachrymal duct, by perforation of the os unguis. This destruction of unimplicated texture, however, is in the present day very properly deemed unwarrantable.

If necrosis accompany the condition of fistula lachrymalis, exfoliation must be patiently awaited; for not until the dead portion of bone has been thrown off, can the soft parts be expected to heal. At the same time constitutional treatment will certainly be necessary.

It is well to remember that fistula lachrymalis may be simulated, tolerably closely, by malignant disease. A medullary tumor, or a malignant polypus, formed in connection with the nasal passages, may project towards the surface at the inner angle of the eye; and its first prominence, yet covered by the stretched and attenuated integument, may occupy the exact locality of the lachrymal sac. But a touch of the part will evince elasticity instead of fluctuation; a glance at the nostrils will show the true seat of the disease; and the cachectic face and general appearance will sufficiently testify to the malignant character.

Obstruction of the Nasal Duct.

We can readily understand how this should be a not unfrequent result of an inflammatory process in the lining membrane. The membrane is at first turgid by soft exudation; and this narrows, and may obstruct, the canal. Such obstruction is temporary in its nature, and capable of yielding to ordinary treatment, whereby cessation of undue action and absorption of extraneous deposit may be obtained. If the process continue, exudation becomes more and more dense, and more enduring; partly mucous in its site, but chiefly submucous; and by continuance or aggravation of such structural change, diminution and obstruction of the canal are rendered plainly inevitable.

For the minor form of obstruction, rectification of the general health, counter-irritation applied over the part, and the use of sorbefacient collyria or injections, will ordinarily suffice. In the more advanced form, the stimulus of the lodgement of a foreign substance in the part is essential to efficient restoration by absorption. In some instances, this indication may be fulfilled without incision, by passing a probe upwards, from the nasal orifice of the duct. The probe, *Gensoul's*, bent nearly to a right angle, at about three-fourths of an inch from its point, is

passed carefully along the floor of the nostril, until it arrives below the anterior extremity of the inferior turbinated bone; then its point is directed upwards into the canal. This manipulation is always doubtful in the first instance, on account of the valvular protection by which the nasal orifice of the duct is guarded, and which must be forcibly broken up; often it proves most difficult to the surgeon, and both teasing and painful to the patient; not unfrequently it fails altogether. It should never be attempted, unless after repeated practice on the dead body. And, even when the introduction can be effected with tolerable facility, it is not unlikely that such means will in the end be found quite inadequate to remove the disease. In all serious cases, therefore, of obstruction in the nasal duct, it is better at once to have recourse to the same treatment as for fistula lachrymalis; to puncture the sac, and proceed with gradual dilatation by styles.

Obliteration and Absence of the Nasal Duct.

1. The nasal duct may be obliterated by change of structure in the membrane. Restoration by perforation may be attempted. 2. It may be shut up entirely by change of structure in the bone. Then restoration in the original site is hopeless; and if anything remedial is attempted, it can only be by perforating the os unguis, and rendering the unnatural aperture permanent.

A case is related by M. Bérard, of congenital absence of the nasal duct; from which there had resulted a congenital fistula, which continued open and discharging at the age of twenty-one. An artificial outlet was formed for the secretion, by perforation of the os unguis.[1]

Dacryolites.

Concretions are sometimes found in the lachrymal passages; mainly lodged in the sac; and consisting chiefly of carbonate of lime, cemented by concrete mucous and albuminous matter. The foreign substance produces swelling and lachrymation, and may ultimately cause fistula. Its presence is easily detected by manipulation, and by the introduction of a probe through one of the puncta. The remedy is simple; incision and removal. The wound may be expected to heal kindly, and without any fistulous tendency. In minor cases, mere expression, without wound, may prove sufficient.

Affections of the Lachrymal Gland.

Dacryadenitis.—The lachrymal gland may be the seat of an inflammatory action, chronic or acute; but either form of attack is rare. The secretion is first increased, afterwards arrested, and then restored in a perverted form. A painful swelling forms in the region of the organ; the eyeball is displaced, and inconvenienced in function and movements.

[1] British and Foreign Review, No. 24, p. 541.

The eyelids are œdematous; and the conjunctiva is apt to sympathize, and take part in the action. In the acute form, the system suffers severely; the pain grows intense, and shoots through the head; and suppuration may take place. If the matter be discharged spontaneously, a fistulous aperture may remain.

The treatment is according to general antiphlogistic principles; when matter forms, an early and free opening is to be made.

Atrophy of the Lachrymal Gland may take place, but this is very rare; the organ ultimately becoming almost effaced. Then either xeroma results; or the conjunctival secretion is augmented, to atone for the glandular deficiency.

Tumors of various kinds may form in the substance of the gland. It is liable to simple *hypertrophy*, amenable to discutients. Sometimes it is the seat of *cystic* formation, remediable by simple puncture; or, if that fails, by excision. *Carcinoma* may attack the gland. Then there is obviously no hope but from early removal. And, in extirpation of the eyeball on account of malignant disease, it is well always at the same time to remove the lachrymal gland—its occupation now gone—whether involved or not; lest, by its continued presence, return and reproduction of the tumor should be favored.

Encanthis.

By this term is meant an enlargement of the caruncula lachrymalis. The enlargement may be a simple and somewhat acute engorgement of the part, the result of an inflammatory process resident therein. This will readily give way to ordinary treatment—scarification, or leeching, fomentation, and sorbefacients.

Fig. 28.

Encanthis.

A chronic swelling, of the nature of hypertrophy or simple tumor, may occur; less amenable to discussion, and often resistful of it. It slowly increases; producing deformity by its prominence and bulk; displacing and obstructing the puncta and lachrymal canals, whence troublesome lachrymation results; preventing due closure of the eyelids; and favoring the occurrence of ophthalmia. If discutients fail, under such circumstances, excision is to be practised; care being taken to leave the puncta canaliculi, and lachrymal sac uninjured.

Sometimes the caruncle is the seat of tumor of a malignant, or at least suspicious character. In such a case, discussion is hopeless; and palliatives of any kind are not employed, if excision be practicable. By early as well as free removal only, can immunity from return be hoped for. It is very rarely, however, that excision of this texture, on any account, is required.

IV. Affections of the Eyeball.

Ophthalmia.

Fig. 29.

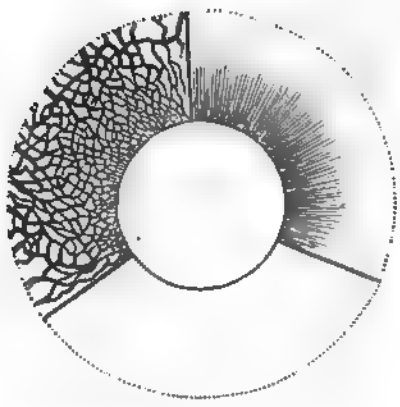


Diagram showing the characteristic vascularity of external and internal Ophthalmia. *a.* External. *b.* Internal. (W. Jones.)

In such a work as this, it is not to be expected that so wide a subject as the affections of the eyeball—so important, varied, and numerous—should be fully discussed in all its details. The leading points only can be overtaken; the student being referred for farther information to the many excellent monographs in this department of Surgery.

Ophthalmia is the general term in which all affections of the eyeball of an inflammatory nature are comprehended; and, according as the superficial or more deeply seated textures are involved, the ophthalmia is said to be External or Internal.

Affections of the Conjunctiva.

The inflammatory process, in all its grades, is very frequently found established in the conjunctiva; and the affection varies materially, not only according to the intensity of the action itself, but also according to the cause which induced it, and the state of the system in which it has occurred. Different varieties of the disease may, in consequence, be enumerated. The most prominent of these are the Simple, Purulent, and Strumous.

Simple Conjunctivitis.

The eye becomes the seat of pain, heat, and lachrymation; there is intolerance of light, and consequent shutting of the eyelids—more or less spasmodic; frequently, there is a sensation as if sand or other foreign matter were lodged in the part. On separating the eyelids, the membrane is seen to present an appearance of unusual vascularity; not from formation of new vessels, but from enlargement of those already there. It is important to remember that these vessels have a peculiar character, whereby affection of this membrane may be distinguished from the affections of more deeply seated parts. The vessels are of considerable size, they seem to advance from the periphery of the globe, where the membrane is reflected from off the palpebræ, are tortuous in their course, freely inosculate with each other, and terminate gradually at the margin of the cornea; they are also observed to follow the move-

ments of the membrane; sometimes they are distinct and separate, because not very numerous; sometimes they are numberless, constituting one mass of angry red; and the redness is usually of a bright scarlet hue (Fig. 29, *a*). Whereas, in sclerotitis, the vessels are small, straight, not affected by the movements of the eyeball, appear first near the margin of the cornea, become paler towards the periphery of the globe, do not inosculate, plainly occupy a deeper plane, and cause a redness of a pink or purplish hue (Fig. 29, *b*).

Fig. 30.

External Ophthalmia; Catarrhal Conjunctivitis.

In what is strictly termed Simple Conjunctivitis, the range of the inflammatory process does not reach higher than active congestion. Effusion takes place copiously; partly beneath the conjunctiva, but chiefly external to it. If the crisis of true inflammation be approached, a temporary drying up of the discharge, with aggravation of all the symptoms, marks the untoward advance.

The system is sympathetically involved; but, in general, its disorder is neither prominent nor severe.

The disease may occur *per se*, or be but a part of a more general inflammatory attack. Not unfrequently, it is merely a symptom of eruptive fever, as in measles and smallpox.

The predisposing causes are numerous; over-exertion of the organ in many ways; derangement of the general health; a glaring, sunny, or dusty season. The exciting causes are equally numerous; exposure to cold, heat, wind, or light; the application of all chemical and mechanical irritants, directly; and the indirect influence of irritant causes, more remotely. The most obstinate forms of the disease are to be expected, when the exciting cause is by a direct irritant which remains in constant operation; as when a particle of sand, dust, or glass, lodges in the membrane, or when it is constantly rubbed or fretted by stray eyelashes.

In the treatment, our first care is to remove the cause. Then antiphlogistics are to be used; but these need not be of the highest class. If the cause—as a foreign substance lodged in the membrane—have been removed at once, nothing may be required in addition to rest of both body and part, low diet, abstraction of light, and continuous application of cold over the shut eyelids by means of wetted lint. The inflammatory process may be entirely averted; or, if just begun, it may very speedily resolve. If not, then blood is to be abstracted locally, and transition made gradually from cold cloths to warm fomentations. The blood may be drawn from the temple, or by cupping at the nape of the neck; or by the application of leeches in the neighborhood of the eye itself. The last method and locality are generally preferred; and care should be taken that all the animals fasten near the inner angle only, immediately beneath the tendon of the orbicularis; for there less pain

will be occasioned, more blood will be drawn, and less risk both of ecchymosis and of erysipelas will be incurred, than when application is carelessly and diffusely made along the eyelids. The amount of local depletion will of course vary according to the intensity and duration of the disease, and the age and constitution of the patient.

The action may simply and steadily resolve; or may pass from the acute to the chronic condition, and there tend to remain. It is to be borne in mind that, in all cases of this affection, not of a traumatic origin, and not occurring in a robust and vigorous frame, the chronic condition, a state differing little from that of mere passive congestion, is very apt to be assumed at an early period—after the lapse of but a few days. Then, continuance of antiphlogistics would but aggravate the morbid state. A change has to be made. It may be advisable to unburden the distended vessels; and this will be best done, by scarification of the conjunctiva on the lower lid. By fomentation, the flow of blood is encouraged; and after this has ceased, gently stimulating collyria are employed, to restore tone to the vessels; solutions of zinc, alum, or of nitrate of silver, are the best; or a dilution of vinum opii begun very weak, and gradually increased in strength. Also, the ordinary stimulus of light is again gradually admitted. In those cases in which amendment is tardy or fluctuating, it is well to adopt the aid of counter-irritation; which is best applied by blistering, behind the ear.

Constitutional treatment is not to be neglected during any period of the case; first moderately antiphlogistic, then alterative, and ultimately tonic. If the occurrence of the attack have been connected with the drying up of any habitual or normal discharge, return of this should be sought for and secured.

When one eye only is affected, it is well to remember the close sympathy which exists between the two organs. The unaffected eye, therefore, should, during the acute stage, be kept equally quiet and shaded from the light, and otherwise treated with prophylactic care. Confinement to a dark room is not generally necessary however, and when the case is chronic, free exposure of the organ to the open air will often prove beneficial.

In the obstinately chronic cases, beneficial change of action may often be obtained by the application of nitrate of silver in solution, or very lightly in substance, to the inner surface of the lower lid immediately after scarification.

A common variety of simple conjunctivitis is termed the *Catarrhal;* whose prominent characteristics are—in addition to those of the simple form—a profuse secretion of vitiated muco-purulent fluid from the membrane, œdema of the eyelids, irritation of the tarsal margins, less intolerance of light, more marked remissions, and the presence of the usual indications of catarrh.

[It is also well to bear in mind that this variety of conjunctivitis, besides being sometimes *epidemic*, is probably, like the more severe *purulent ophthalmia*, contagious. Such, at least, seems to be proved by the rapid manner in which it spreads over communities of persons, as children in orphan asylums, after the accidental introduction of a single case. Consequently, the same care should be used against contact of the

purulent or muco-purulent secretion, from eye to eye, as in the case of purulent ophthalmia.

The most efficacious treatment is unquestionably the application to the inflamed conjunctiva of a solution of nitrate of silver, 5 to 10 grs. to the ounce of distilled water, repeated at first every day; mild purging and stimulating pediluvia are also serviceable adjuvants; in ordinary cases, local bleeding is unnecessary.—ED.]

Purulent Conjunctivitis.

Purulent ophthalmia seems to be merely an aggravated form of catarrhal conjunctivitis, running its course, however, much more rapidly, and mainly distinguished from the latter, in its mild form, by the discharge being purulent instead of muco-purulent. But when purulent discharge occurs in the simple form, an aggravation of the inflammatory process having been somehow induced, such a circumstance is to be regarded as an accidental intensity in acute simple conjunctivitis, rather than as an example of true purulent ophthalmia. Usually, action is from the first intense, and suppuration is very speedily attained. The first symptoms are pain and itching in the palpebral conjunctiva, and often there is a sensation as if foreign matter were lodged there. Then the ordinary characters of conjunctivitis appear, in an aggravated form. The pain is not confined to the eye, but shoots through the head, and not unfrequently extends to the face also. The eyeball becomes quickly covered with meshes of enlarged conjunctival vessels; the membrane itself is infiltrated and tumid; a profuse purulent secretion is poured out; the eyelids are swollen and œdematous, often to a great extent; ordinarily, the eyeball is concealed by the tumid lids; on opening them forcibly, purulent matter escapes in increased quantity, and eversion is apt to ensue—the engorged and red conjunctiva becoming exposed.

As the disease advances, the conjunctival lining of the eyelids, more especially of the upper, changes from the uniform, vascular, and villous appearance, to one of more irregularity, as if granulating. The conjunctiva is then said to be *granular*. This term, however, does not imply that the membrane becomes actually studded with true granulations; the fleshy elevations being mere enlargements of the natural papillæ. These continue to furnish a profuse discharge; and the friction of them over the ocular conjunctiva doubtless maintains the general morbid action.

The ocular conjunctiva, it has been already said, undergoes change of structure. Exudation and extravasation take place both interstitially and beneath it. Serum, or fibrine, if the disease be very acute, is effused between it and the sclerotic, causing it to bulge considerably over the margin of the cornea, and leaving that texture in the relative position of a depression or dimple. This state is termed *Chemosis;* the result of true inflammation in the conjunctiva. When the action is acute, and the chemosis great, the cornea is in danger of sloughing; partly from over-action, and partly by the strangulating effect of the surrounding swelling, checking the supply of blood to the cornea, and causing it to die from want of nutrition.

The system sympathizes to a great extent. At first inflammatory fever is developed. Afterwards, the form of Constitutional Irritation is often assumed. Vision is in imminent danger, by change of structure in the cornea, and also by disorganization of the entire globe; for to the latter result this affection may advance, under circumstances of either neglect or severity.

In Egypt, the disease prevails as an epidemic, and has done so for ages; of the most virulent and intractable form; very fatal to sight; originally induced by sun and sand, propagated, also, by direct contagion; and in effecting reproduction by the latter mode, the flies are said to be active agents—passing from one eye to another, tainted with the contagious matter. In this country, it is happily both less frequent and less severe. It may follow injury; and then the purulent discharge is to be looked on as the mere consequence of a high amount of inflammatory action induced by a powerful exciting cause. Want of cleanliness, and of ventilation, and the overcrowding of inmates—as in schools and barracks, and on board of ship—predispose to the production of this form of disease, under the influence of a comparatively slight exciting cause. Thus occasioned, it is undoubtedly contagious; the matter of one patient, applied to the sound conjunctiva of another, being capable of inducing a similar affection. And when many patients happen to be crowded together, without due cleanliness and ventilation, there is good reason to believe that the infectious character is also acquired.

Treatment, in energy and promptitude, requires to be proportioned to the rapidity and intensity of the disease. It is only by active and early, as well as suitable measures, that we can hope to avert change of structure and impairment of function. When the patient is robust and plethoric, and there is intense supraorbital pain, headache, chemosis, and a feeling of tension and throbbing in the eye, blood is to be drawn not only from the part, but from the system; with a full antiphlogistic effect in view. The bowels are to be well acted on. Regimen should be most sparing; with quiet, and seclusion from all stimuli—light more especially. If not strongly contraindicated, by constitutional or other causes, calomel and opium are to be freely administered, to excite gentle ptyalism; for the action is intense, the texture delicate, and the function important (*Principles*, 3d Am. Ed. p. 169). The eye is to be diligently fomented with an anodyne fomentation.

If the case be not seen till the disease has made progress, and lost much of its acute type, both locally and constitutionally, such severe measures are of course unwarrantable. And a like reservation will be required in the case of the puny adolescent, perhaps scrofulous as well as sickly, who may happen unfortunately to become a victim.

When the second stage has set in, we cease from constitutional antiphlogistics—though still maintaining the most guarded regimen; the local, too, are proceeded with differently. The swollen conjunctiva is to be freely scarified, in order to empty its sanguineous contents, and at the same time to afford ample space and opportunity for the interstitial and subconjunctival exudation to escape. The palpebral conjunctiva is divided with a lancet or scarificator, in a horizontal direction; the eyelids being freely everted for this purpose; and sepa-

ration of the lids ought to be maintained for some time, so as to favor the escape of blood. The chemosed ocular conjunctiva is to be divided also in a horizontal direction; otherwise, the cornea, already in a critical condition, will have its sloughing accelerated and made certain by interruption of the vascular supply. Or, rather, the incisions are begun at the corneal margin, and made to radiate outwards to the circumference, as recommended by Mr. Tyrrell; there being thus less risk of cutting across the vascular supply of the cornea, than in any other form of incision. This incision of the chemosis is not always to be reserved for the second stage; but is often highly expedient at an early period, when the action is yet acute; in order to save, if possible, the threatened cornea, as well as to obtain a general resolutive effect upon the inflammation. Fomentation is to be used for some hours after the scarification, so as to favor the flow of blood; and then the nitrate of silver is advisable. Probably, the best way of employing this remedy is to apply it, either in substance or in solution, to the eyelids; on these it exerts a direct and powerful remedial effect, opposing the congested and granular state; and from these it is gradully diffused over the globe, with an effect more gentle but equally beneficial. The application is made daily, or every second day, according to circumstances. Throughout the whole treatment, it is essential that matter be not allowed to accumulate beneath the swollen and shut lids; these are to be gently opened from time to time, and the pus washed away by warm water, or by some gently astringent fluid—anodyne or stimulant, according to the stage of the disease. For general use, there is nothing better than a weak solution of nitrate of silver dropped into the eye once or twice a day.

It ought to be borne in mind, throughout the whole period of treatment, that the discharge is of a contagious nature; and the patient, practitioner, and attendants, should guard accordingly against direct propagation of the disease.

If the morbid state still persist, and become more and more chronic in character, the nitrate of silver may be well superseded by some more purely stimulating remedy; as the sulphates of zinc and copper. Or some of the preparations of mercury may be employed; in form either of ointment or of solution. At this period, too, counter-irritation, by blistering behind the ears, or on the nape of the neck, will not be without its use. The state of the system, throughout the whole course of the disease, must be well considered; often a combination of tonics with alteratives will probably be required.

When a swollen and altered state of the palpebral conjunctiva obstinately remains, after comparative disappearance of the other symptoms, this lingering one must be attacked with more energy. The sulphate of copper or nitrate of silver is applied lightly over the parts. Or the enlarged granulations may be at once removed, either by knife or scissors. The surface which remains is then made the subject of ordinary treatment. Of course, care must be taken that the removal of texture be not excessive; otherwise entropion is likely to ensue.

Such is the nature of the ordinary Purulent Ophthalmia. Two varieties of the disease require a separate though brief notice.

Ophthalmia Neonatorum.—By this term is understood Purulent Conjunctivitis, occurring in the recently born child. It may be induced by mere want of cleanliness, by imprudent exposure of the delicate organs of sight to intense light, or by the direct application of other stimuli. But frequently it owes its origin to direct contamination of the conjunctiva by vaginal secretion, during parturition. The disease presents its ordinary characters; and there is much risk of permanent loss of sight by pearly opacity of the cornea.

Children have been born with opaque corneæ, apparently the result of purulent conjunctivitis. It has been inferred, therefore, that this disease may occur in utero. Such opacity, however, may be the result of mere arrest in development.

The treatment is founded on antiphlogistic principles, proportioned to the age and condition of the sufferer. But much depends on an early commencement being made. Then mild measures suffice; bleeding will seldom be required, either by leeches or by scarifications; and counter-irritation, also, will rarely be necessary. It is enough to employ simple ablution, frequently repeated, perhaps every second hour; soon gently medicating the collyrium by means of alum, decoction of oak-bark, or other astringent; the proportion of which is gradually increased. A weak solution of nitrate of silver dropped into the eye, once a day, is of much benefit. Great attention to cleanliness is to be always maintained, and the eyelids should be prevented from adhering together, by applying a little red precipitate ointment to their edges at night. Attention is at the same time paid to the primæ viæ and general system.

Gonorrhœal Ophthalmia.—The application of recent gonorrhœal matter from the urethra to the conjunctiva, produces the most intense form of purulent conjunctivitis. One eye ordinarily is affected, for it is seldom that both are at once inoculated; and, in this respect, there is a difference from the ordinary purulent conjunctivitis. In the latter, also, the morbid action usually commences in the palpebral conjunctiva, resides there chiefly, and extends only secondarily to the ocular portion of the membrane. But, in the gonorrhœal form, the reverse is the case; the disease would seem, in most cases, to commence in the ocular conjunctiva, and to extend thence to the palpebral. Action is unusually intense, and the hazard to vision is great; for the cornea, surrounded by a firm fibrinous chemosis, is in a most perilous state, and not unfrequently perishes by sloughing; or the action may pass deeply, and terminate in general disorganization of the globe. The treatment is in no way peculiar; only proportioned in activity to that of the disorder. General bleeding ought seldom to be omitted at the outset; and this may be regarded as imparting a proper tone to the rest of the treatment. Strong solutions of nitrate of silver are found to be of much service, so soon as the first acuteness of the inflammation has been subdued. The rest of the treatment is similar to that already recommended in ordinary purulent conjunctivitis; but it should be borne in mind that this disease is more acute, and runs its course more rapidly than the other.

Strumous Conjunctivitis.

This affection of the membrane, in addition to the ordinary traits of the strumous cachexy, is characterized chiefly by remarkable photophobia, or intolerance of light; often, with comparatively little pain and vascularity; though sometimes the vascularity is considerable; by tendency of the enlarged vessels to collect into fasciculi, which stretch towards the corneal margin, terminating there in pustules or phlyctenulæ; by exacerbations occurring in the morning, while there are remissions at night; the opposite of what obtains in other ophthalmiæ. Corneal change of structure, as ulcer, is extremely apt to ensue. The affection seldom occurs after puberty; and prevails chiefly during childhood. At that age, the intolerance of light, with spasmodic closure of the eyelids and copious lachrymation, is certainly the most prominent symptom. The child "keeps its hands pressed on the shut eyelids, and turns its face on the nurse's shoulder, or, if in bed, on the pillow, even in comparative darkness. In chronic cases, the edges of the lids are kept in this manner in an almost inverted condition, and the eyelashes get under, and are there retained, augmenting the distress." The cheeks are scalded by the discharge which almost constantly wets them, and become covered with an angry eruption. The features are contorted; and a confirmed expression of pain and discontent is assumed. On attempting to open the lids, much suffering is occasioned; the lachrymation increases, the lids become more inverted, and the eyeball is rotated upwards and outwards so as to conceal the cornea.

The treatment consists in constitutional management, suited to this particular cachexy conjoined with an inflammatory process in an important part; in slight local depletion by leeches; in applying nitrate of silver to the integument of the lids, lightly, so as to blacken merely; in the use of a weak solution of this substance as a collyrium, and in counter-irritation by blistering behind the ear. The last remedial means, however, is to be used with caution; otherwise, it is apt to excite troublesome scrofulous enlargement of the cervical glands. Sometimes benefit is obtained by the local use of belladonna, smeared over the eyelids, which seems to act as a sedative in such cases. Or, it may probably afford relief by temporarily paralyzing the iris, and so placing that contractile texture in a condition of repose. In the early stage of the disease, an emetic is generally of much service. No medicine, however, seems to act so beneficially as quinia, which often displays a decided influence in allaying the morbid sensibility, relieving the intolerance of light, and removing the inflammation. For bathing the eyes, warm water is used, simple or medicated with opium. The child should have a solid and nutritious diet, and should not be confined to the house, unless during cold and wet weather.

Granular Conjunctiva.

The granular condition, dependent on a hypertrophied state of the mucous papillæ of the palpebral conjunctiva, has been already noticed

—as constituting an important integral part of purulent conjunctivitis. But a similar change of structure may occur, quite independently of this latter disease. It may be the result of a chronic inflammatory process resident in the palpebral membrane. At first, doubtless, there is mere enlargement of the normal structure; but after a time, this is more or less altered by continuance of plastic deposit; the surface becoming dense as well as prominent, rough, irregular, and sometimes fissured. The upper eyelid is more prone to suffer than the lower.

Fig. 31.

Granular Conjunctiva. The eyelid everted.

It can be readily understood how such a structure, at each movement of the lid, must greatly fret the ocular conjunctiva, causing an irritation there sufficient to light up inflammatory action, and more than sufficient to maintain an action which has been already established. To remove the alteration of structure, therefore, becomes a most important therapeutic indication. In the first instance, scarification of the eyelid is to be employed; followed by the application of nitrate of silver, used either lightly in substance on the part or in strong solution. If the nitrate prove unsatisfactory, other astringents may be employed instead. Failing these, the altered part is to be removed by knife or caustic. The nitrate of silver or sulphate of copper may be applied firmly to the surface, so as to have a destructive effect. But in general, it is better to remove at once, by knife or scissors, the enlarged granules; great care as usual being observed, lest by excessive ablation entropion be established on cicatrization. The general health ought in all cases to be attended to, as the disease frequently occurs in lymphatic or strumous individuals. Repose of the eye ought to be enjoined, with due attention to diet, exercise, and change of air.

[A decided objection to the removal of granulations of the eyelids by the knife or scissors, and even to the free scarification of the lids, exists in the fact that permanent thickening, induration, and irregularity of the mucous surface of the lid, is usually the result of all such proceedings. It is much better to trust to the local applications advised by the author—nitrate of silver in substance or in strong solution (℈j or ℥ss to the ounce of fluid), or a smooth crystal of sulphate of copper—and to the administration of proper alteratives, of which one of the best, as has been found at the Wills Hospital, is cod-liver oil. This method will not procure the removal of the granulations so speedily as excision; but the cure will be more permanent, and will not be attended by the unpleasant consequences alluded to. The applications should be made every second or third day, according to their effect.

The altered condition of the ocular conjunctiva and cornea, induced by the state of the lids, generally demands appropriate treatment also. —Ed.]

Pterygium.

Pterygium denotes a vascular and fleshy thickening of the ocular conjunctiva. The formation is of a triangular form; the base resting on the internal or external canthus, and the apex stretching towards the cornea. When of moderate size, and not advanced farther than the corneal margin, vision is not interfered with; but when it begins to encroach on the cornea, the affection then ceases to be a mere deformity or inconvenience; sight is in danger, and remedial measures are required. Sometimes the web is thin and membranous; consisting chiefly of varicose vessels held together by fine areolar tissue. Sometimes the structure is dense, firm, and fleshy; sometimes it contains a large proportion of adipose substance.

The term ***Pannus*** is applied only to those cases in which the cornea is completely covered with red vessels, presenting the appearance of a piece of red cloth, and very materially interfering with vision.

In the milder cases of pterygium, a cure may be attempted by scarification and astringents; the scarifications being made across the dilated vessels, in the sclerotic conjunctiva. In those cases in which the cornea is encroached upon, excision of the sclerotic portion is to be had recourse to, if the milder measures fail, as they are likely to do. The membrane is elevated by a fine hook, and carefully removed by knife or scissors. The corneal covering is then usually found to disappear. When, in pannus, the whole cornea is covered, a cure is said to have been effected by inoculation of the morbid tissue with the discharge of purulent conjunctivitis; the inflammatory action which thence results having the effect of breaking up the morbid tissue, and rendering it amenable to removal by absorption. This, however, is a very dangerous mode of treatment; the eye may be lost in consequence of the violent inflammation which is induced, and the patient's health may be much injured by the severe measures which may be requisite to subdue that inflammation. Such procedure, therefore, is plainly inapplicable, except to those extreme cases in which the cornea presents no sound part, but is completely and thickly covered; and in which, consequently, the condition of the eye can scarcely be made worse.

Fig. 32.

Pterygium, double.

Affections of the Cornea.

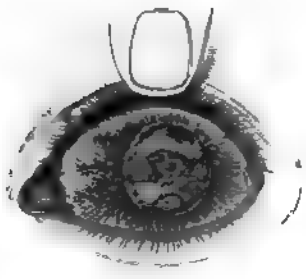
Corneitis.

The inflammatory process, affecting the cornea, may be either an original affection, or merely an extension from previously existing conjunctivitis. It may originate either from injury done directly to the part

itself, or from an exciting cause applied to some other part of the surface of the eye. The conjunctival investment only may be involved; and this is most likely to occur when the affection is a mere extension from conjunctivitis; or the action may be mainly and originally resident in the proper substance of the cornea. All forms of conjunctivitis, when of any duration, are apt to implicate the cornea; but the strumous form more especially.

A red zone of dilated vessels encircles the corneal margin, generally at the upper part; and between the two there is no intervening clear space of white sclerotic, as in affections of the deeper parts of the eye. When the conjunctival covering is involved, small hair-like vessels are seen ramifying on it, in greater or less number, continuous with those constituting the outer zone. When the proper substance alone is affected, such vascularity is, in the first instance, not discernible, unless by the aid of a magnifying glass. There is pain in the eye, and in the orbit generally; lachrymation and intolerance of light. By and by, the cornea loses its transparency, becoming turbid, and of a bluish-white appearance. The various results of the inflammatory process may then ensue—varying according to the intensity of the action; deposit of plastic lymph, producing thickening and opacity; formation of pus between the corneal layers, afterwards absorbed, or making its way either externally or into the anterior chamber; chronic ulceration, commencing superficially with mere abrasion, in which case the surface of the cornea is more or less rough, and bears some resemblance to a piece of ground glass, but which appearance, on close inspection, is found to consist of a crowd of minute ulcers; or, there may be a large ulcer, originating in the giving way of a pustular formation; lastly, sloughing, either of the whole or of a part, seldom occurring in the case of simple corneitis alone, but only when this is part of an extensive and severe ophthalmia. If a foreign body be left imbedded in the cornea, it is very evident that inflammation, suppuration, and ulceration must ensue; in obedience to the general law, whereby natural extrusion of foreign matter is effected in all living textures.

Fig. 33.



Corneitis.

In the treatment, general depletion is not often necessary; local abstraction of blood, however, by leeches, is of much service. Counter-irritants, by means of blisters behind the ears, are of use. Purgatives, antimony, and mercury are the most appropriate remedies for arresting the progress and removing the effects of the disease. But, of these, mercury seems to act more beneficially than any other. When a debilitated condition of the system causes protraction of the malady, the eye continuing irritable and intolerant of light, quinia and an improved diet will be required. At first, the local applications should consist of opiate fomentations; but as the disease becomes more chronic, weak stimulants, as vinum opii, or a solution of nitrate of silver (four grains to the ounce) are to be employed.

Strumous Corneitis is of very frequent occurrence in the young; it is more chronic than the simple form, and usually mainly resident in the conjunctival covering. The vascularity is less, and more diffuse; and the zonular arrangement at the corneal margin is less distinctly marked. Opacity is the ordinary result; and pustules, ending in troublesome ulcers, are not uncommon. The treatment is such as is calculated to subdue chronic conjunctivitis, with an especial reference to the depraved state of system. Mild mercurials should be given to check the deposition of opaque matter in the cornea; and, combined with these, quinia is useful to improve the general state of the system. In general, the affection proves of rather an intractable nature.

Aquo-Capsulitis.—This term denotes the inflammatory process resident in the serous membrane of the aqueous humor, including the internal layer of the cornea. It may occur *per se;* or it may form an integral part of the preceding affection. It is characterized by "a pale, deeply-seated opacity, which is unequally distributed, imparting to the cornea a mottled appearance; and by a turbid or cloudy state of the aqueous humor." Sometimes lymph is exuded, and coats the membrane. This disease is very apt to run on to inflammation of the iris. The treatment is as for corneitis, or iritis.

Abscess of the Cornea.

Matter, as we have seen, may form between the layers of the cornea; a result of corneitis. If it collect at the lower part, the accumulation usually assumes a crescentic form, resembling the white semilunar mark at the root of the nail; and hence such an appearance is termed *Onyx.* But it may be deposited elsewhere, in the form of dots or points, which may either remain separate, or may unite with each other by increase and extension. The fluid seems to be purulent. It may, however, be a less advanced inflammatory exudation.

Antiphlogistics will plainly be the most likely means whereby the secretion may be arrested, and its disappearance by absorption favored. And in order to effect these two indications rapidly, in time to save structure and function, the systemic influence of mercury is highly available—obtained as soon after local bloodletting as possible. Failing absorption, one of three events may occur. The small collection may spontaneously discharge itself internally into the aqueous humor, forming an hypopion; or it may assume the pustular form, and escape externally, when an ulcer will be the result; or an artificial opening may be made for its external evacuation. In the greater number of cases, the artificial opening is withheld, in the hope that disappearance by absorption may take place; and the frequency with which this result does occur, would lead to a suspicion that the fluid is not truly purulent. If, however, the fluid be of considerable quantity, causing tension in the part, and painful symptoms of an aggravated character, the apex of the abscess may sometimes be touched beneficially, with a fine point of the nitrate of silver. A small slough is thrown off, the matter is discharged, and an ulcer remains, which heals readily. The only application to the eye should be opiate fomentations.

Ulcer of the Cornea.

Ulcers are often the result of corneitis. Their origin may be from without, when the conjunctival covering of the cornea is chiefly affected, and then the commencement is with superficial abrasion, sometimes extensive; or a pustule forms, elevating the conjunctival layer; and, on the giving way of this, ulceration follows, still superficial. Or the origin may be from within; matter collects between the true corneal layers, and is discharged externally, leaving an ulcerated aperture; or foreign matter has lodged in the cornea, and is extruded by suppuration and ulceration. In either of these latter cases, the ulcer is deeply seated and serious.

The ulcer here, as elsewhere, presents different characters under different circumstances. Sometimes it is acute; the inflammatory action is still in progress, loss of substance is advancing, and there is no attempt at repair. In this state, the ulcer looks as if a portion of the corneal substance had been dug out mechanically; the edges are abrupt, or they may be thickened and swollen, and in and around them are the usual signs of inordinate action. Very frequently, a distinct plexus of vessels is found leading to the ulcer. The pain, lachrymation, and photophobia are most distressing. Or the ulcer degenerates into the irritable form; the loss of substance growing neither larger nor less; the margins and surface showing an angry and vascular appearance, often as if covered with a layer of wetted chalk; and the symptoms all undergoing intense aggravation. Or the sore may be of a healthy and healing disposition. Then the edges are less abrupt, and as if bevelled off; the chasm is diminishing; a white haziness surrounds the margins, and invests the surface, denoting the deposit of plastic exudation; and the unpleasant symptoms are all very much diminished. Or the ulcer may stop short in the progress towards cicatrization, and assume the indolent character; becoming stationary, and causing comparatively little inconvenience. This last phase, however, is certainly not the one of most frequent occurrence.

In the case of the acute ulcer, it is obvious that the only suitable treatment is antiphlogistic, with mercury given, if necessary, in small quantity, in order to change the perverted condition of the capillaries; and this is to be continued, along with an especial regard to the general health, until the overaction is subdued, and symptoms of repair succeed those of destruction of texture. Then, in the healing sore, we must content ourselves with watching the natural progress of cure, and carefully guarding against reaccession of inflammatory action, by exclusion of light and other stimuli, by regulation of diet, and by the use of tepid soothing applications. In the irritable sore, nothing is so useful as the nitrate of silver, applied either lightly in substance to the ulcer, or in solution by means of a hair-pencil. It acts probably in two ways; by its escharotic power destroying the sentient extremities of the nervous tissue; by its coagulating power forming a protecting film for the raw surface. The application is repeated every second or third day, until the irritability cease; or the interval is shortened or increased, as cir-

cumstances may seem to require. When either the irritable or inflamed condition threatens to prove obstinate, great benefit often is derived from counter-irritation by blistering behind the ears. For the indolent sore, the various stimulant collyria are suitable. When the strumous habit is strongly declared, as it too often is in ulcerated cornea, little permanent good will be done by any local management, unless constitutional treatment be at the same time duly employed.

As a general rule, the preparations of lead should never be employed as collyria, in the case of ulcer of the cornea. An insoluble chloride of lead will be formed; and this, becoming entangled in the cicatrix, will render it more irremediably opaque than it otherwise would have been. The sustained use of nitrate of silver, also, should be conducted with caution, lest an olive-colored stain ensue.

When the ulcer is deep, acute, and situate near the centre of the cornea, there is great risk of perforation of the inner layer, escape of the aqueous humor, and protrusion of the free margin of the iris, to a greater or less extent. To obviate this last accident as much as possible, belladonna is employed to maintain a dilated state of the pupil; so that the margin of the iris may be retracted out of harm's way. If, however, the site of ulcer be towards the circumference, the use of belladonna would probably be prejudicial.

Previously to completion of the perforated aperture, the membrane of the aqueous humor sometimes protrudes in the form of a small transparent vesicle; this condition is termed *Hernia of the Cornea*. It ought to be touched occasionally with a solution of nitrate of silver, and the iris should be kept fully dilated by belladonna to prevent its being prolapsed, in the event of complete perforation taking place.

Sometimes the perforating ulcer heals only in part, contracts, but does not close, becoming a fistulous aperture, through which the aqueous humor continues to escape. This is remedied by the occasional application of nitrate of silver, finely pointed, to the part, and by a tonic system of treatment constitutionally.

The iris, protruding through the perforated cornea, forms a black tumor, usually of no great size; bearing a slight resemblance to the head of a fly; and, therefore, termed *Myocephalon*.

Fig. 34.

Myocephalon.

Sometimes the iris does not protrude, but simply rests upon the aperture, and closes it up; and in this abnormal position it may become adherent. In either case, the pupil will be deformed, and vision may be seriously impaired. The indications of cure are to restore the iris to its normal position, and to hasten cicatrization of the aperture. In recent cases the protrusion, when slight, may be overcome by placing the patient on his back and applying belladonna; and antiphlogistics are to be employed, to avert or moderate the inflammatory action which is to be expected to ensue. When, however, protrusion is considerable, the aperture being capacious, immediate replacement is not desirable; temporary and partial protrusion being the salutary means whereby Nature prevents complete escape of the aqueous humor,

and consequent collapse of the eye. Under such circumstances, we content ourselves with rest, exclusion of light, supine posture, use of belladonna, and occasional application of the nitrate of silver; thus promoting healing of the sore, removing irritability of the texture involved, and favoring gradual replacement of the iris. In cases in which the displaced portion of the iris has contracted permanent adhesions with the cornea, replacement cannot be effected; removal of the protruded part is had recourse to, either by cutting instruments or by caustic; and then cicatrization of the remaining sore is attended to.

Opacities of the Cornea.

Nebula is the thin cloudy opacity which follows inflammatory affection of the conjunctival covering of the cornea. It arises from slight structural change remaining in that tissue, and is the form of opacity most likely to be removed, so as to leave the part altogether of its healthy character. The indications of treatment are—to obtain final extinction of any inflammatory excitement which may remain; and, afterwards, to favor disappearance of the structural change, by absorption. The former indication is fulfilled by the usual means; the latter, by the guarded use of various stimulant applications. The nitrate of silver, sulphate of zinc, or other substances, may be applied in solution; or fine powders—as calomel, oxide of zinc, alum, &c.—may be blown on the part through a quill; great care being always taken that this part of the treatment is not overdone, and inflammatory reaccession, with probable extension of the opacity, consequently re-established. In the more obstinate cases, iodine is said to be advisable, both externally and internally. And of late, the local use of hydrocyanic acid has been found of considerable avail. The state of the eyelids should, in all cases, be carefully attended to; for, not unfrequently, a granular condition of the palpebral conjunctiva is the cause of the opacity's continuance, if not of its first formation. The curative process is necessarily gradual; and patient perseverance in the use of remedial means is consequently required.

Albugo denotes the more deeply seated opacity which results from plastic exudation between the layers of the cornea. It, too, is amenable to absorption; but not so favorably as the conjunctival deposit. The treatment is conducted on the same principles; but with a certainty of longer perseverance being required, and with a less sanguine expectation of an altogether successful issue. If the changed part be seen traversed by bloodvessels, the prospect of complete cure may be regarded as especially unpromising.

Leucoma is the dense pearly opacity which results from cicatrization of a granulating wound or ulcer of the cornea; it is, in short, a corneal cicatrix—thick, opaque, and little amenable to change. Sometimes there is a black point in the otherwise white opacity; denoting entanglement, at that part, of a portion of the iris. Treatment, with the hope of discussion, is of little or no avail. Remaining overaction is subdued, and stimulants employed. But the latter are not used with the hope of altering the cicatrix itself; but only in order to dissipate

the nebulous or the albuginous halo, with which the leucoma is usually surrounded. If the opacity be central and small, vision will be greatly improved by habitual dilatation of the pupil by means of belladonna; if it be both central and large, the only hope of amendment is by the formation of an artificial pupil.

It has been proposed to dissect off opacities of the cornea; but, obviously, success can never follow any such procedure; inasmuch as the loss of substance, caused by the dissection, must heal in the ordinary way, and so healing must produce at least an equally opaque and extensive cicatrix. It has been proposed, however, to operate in one class of cases, with a rational and fair prospect of ultimate benefit. The opacity which follows injury of the cornea by sulphuric acid, would seem, occasionally at least, to be a chemical incrustation on the cornea, rather than a vital change of and in its structure; sulphoproteic acid is said to be produced, and adheres to the external layer of the cornea; and this may be scraped away, immediately after receipt of the injury, by the edge of a fine knife, leaving the rest of the part clear and free.[1]

[In his "Lectures on the Parts concerned in the Operations on the Eye," London, 1849, Mr. Bowman gives an account of two cases in which this operation was performed with complete success on both eyes of each patient. The opacity came on gradually, and without contact of acid, or any other special cause. The opaque patches were brownish in color, mottled with dark dots, and stretched horizontally across the cornea, so as completely to obscure the pupils, unless these were much dilated; they seemed to be superficially situated, as if in the anterior elastic lamina of the cornea. Ordinary treatment having been entirely unavailing, the point of a knife was applied, the epithelium first removed, and then the hard opacity which came off in flakes, leaving the pupil perfectly transparent. The operations were painful, but no inflammation followed of any consequence; in a few days new and healthy epithelium was reproduced, without any return of opacity, and vision was very much improved; in one eye, in fact, the sight was so good, that the smallest "pearl type" could be read with it.

The opacity consisted of salts of lime and magnesia, principally phosphates.—*Op. cit.* pp. 117–121.—Ed.]

In advanced years, and sometimes even in the comparatively young adult, the corneal periphery gradually becomes opaque, and of a gray color. The affection is termed *Arcus senilis;* a mere deformity; and not amenable to remedial treatment.

[This circumferential opacity has been demonstrated by Mr. Canton, to depend upon a *fatty degeneration* of the margin of the cornea. It frequently coincides with the same abnormal condition of other organs, as of the heart.—Ed.]

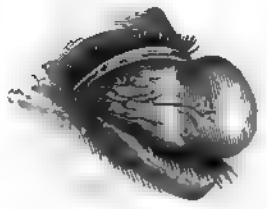
Staphyloma of the Cornea.

Staphyloma of the cornea is an opaque projection of a part, or of the whole of this membrane.

[1] Lancet, No. 1010, p. 537.

Partial staphyloma is usually situated at the lower or lateral part of the cornea. The iris is adherent to the whole inner surface of the projection, and, consequently, the anterior chamber is much diminished in size; generally, the pupil itself is more or less involved, and vision rendered very imperfect. The affection is caused by an ulcer penetrating the cornea, and allowing the iris to become prolapsed through the opening. When a considerable portion of the iris has protruded, it does not shrink when the inflammation subsides, but remains, and forms a projection at that part of the cornea. After a time, the exposed projection of the iris is covered by an opaque firm tissue, of the nature of cicatrix, the edges of which become incorporated at the base with the sound cornea. It is generally the consequence of strumous, catarrhal, or purulent ophthalmia.

Fig. 85.



Staphyloma.

Total staphyloma is formed exactly in the same way; it differs only in degree. When, as is often the case in purulent ophthalmia, the whole or greater part of the cornea is destroyed, the iris falls forwards, the pupil closes, and the aqueous humor, accumulating in the posterior chamber, keeps the iris distended in the form of a tumor in the front of the eye. The surface of this tumor, as in the partial staphyloma, becomes gradually covered with a firm opaque cicatrix-like tissue of more or less thickness; and a total staphyloma results. This pseudo-cornea, or staphyloma, has the form and appearance of a small globe stuck on the front of the eye, with sometimes a ring of the proper cornea surrounding its base. It is often so large as to project considerably from between the eyelids, and prevent them from closing.

When the staphyloma is large, the iris, being unable to expand to the same exent as the pseudo-cornea, is torn and separated from the choroid; and when the staphyloma has been removed, the iris is found in contact with its posterior surface, broken up and in shreds. This does not occur in a small or partial staphyloma. Vision in total staphyloma is completely destroyed.

For the treatment of a small partial staphyloma, the less that is done the better; except to guard against any tendency to inflammatory action. If it be large and implicate the pupil, the projection may be diminished, by touching it from time to time with some caustic—as the caustic potass—in order to produce condensation and contraction; which it does by exciting a slow inflammatory process.

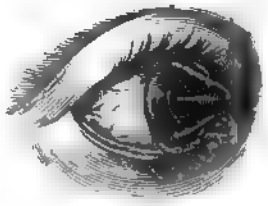
In the total staphyloma, relief is sometimes obtained by puncturing it from time to time with a large cataract-needle, and allowing the aqueous humor to escape, when the projection collapses. As the aqueous humor, however, becomes almost invariably reproduced in the same or even greater quantity, and as the staphyloma is a great deformity, besides keeping up a constant state of irritation which is apt to extend to the other eye, its removal should be recommended, so that an artificial eye may be worn. In removing a staphyloma, the eyelids being properly fixed, and a hook passed through the projection in order to command

the globe, the base of the tumor is transfixed with a cataract-knife from its temporal to the nasal side, a little below its transverse diameter; the knife is then pushed on, and a flap is formed as it cuts itself out. This flap is seized with a pair of beaked forceps, and that part of the base of the staphyloma which remains uncut is divided with curved scissors, and the whole removed. The lens and some of the vitreous humor often escape; but generally sufficient remains to form a good stump for an artificial eye. After the operation, a pledget of lint, soaked in cold water, should be kept applied upon the eyelids, as a preventive of inflammatory action. If severe reaction supervene, it is to be treated by active antiphlogistics. When bleeding follows the operation, it is checked by cold wet compresses, or by ice applied over the eye.[1]

Conical Cornea.

Sometimes the cornea, "retaining its transparency, gradually assumes a conical or pyramidal form; and when viewed from certain positions, reflects the light so strongly as to exhibit a peculiarly brilliant and sparkling appearance, characteristic of the disease. It generally affects both eyes, though not in an equal degree; has been observed at all periods of life, but more commonly about the age of puberty; and is said to be most prevalent among females."[2] On the whole, it is a rare affection, and fortunately so, being but little capable of amendment. If the apex protrude from between the lids, it is liable to become opaque. Or ulceration may take place; and then staphyloma is not unlikely to supervene.

Fig. 86.



Conical Cornea.

In the clear conical cornea, palliation may be obtained by adapting concave spectacles provided with a small central transparency. Lately, it has been said that amendment, if not cure, has followed perseverance in the use of purgatives and emetics;[3] but how the beneficial result is so obtained, it is not easy to understand or say. When the apex is opaque, temporary amelioration of sight may be secured, by transferring the pupil to a point of the circumference which is as yet clear.

Over-distension of the Cornea.

Simple over-distension of the cornea, by an unwonted accumulation of the aqueous humor, produces both dimness and prominence. If this state be the concomitant of an existing inflammatory process pervading the eye, as corneitis, by subjugation of this the cornea will sometimes be restored. If, on the other hand, the morbid state is not so connected, but of a passive and indolent nature, antiphlogistics will do no good, and are likely to do harm. From the internal use of the iodide of

[1] *Vide* Wharton Jones's Manual, p. 186, *et seq.*

[2] Littell, p. 188.

[3] Dublin Journal of Medical Science, January 1844, p. 857.

potassium, or—failing this—from a cautiously given alterative course of mercury, more benefit is to be expected; a diminution being thus made in the aqueous humor, on whose plethora the over-distension depends. Repeated evacuation of the aqueous humor, by means of a needle, is often of service.

Affections of the Sclerotic Coat.

Sclerotitis.

This may occur as part of a general inflammatory process, however excited. Not unfrequently, it exists *per se*, and then almost uniformly is of rheumatic origin; exposure to cold, probably, having proved the exciting cause. It is most frequent in the adult, and about the middle period of life, and is often limited to one eye. Pain is complained of, of a dull, aching kind; increased by pressure, and by movement of the globe; partly resident in the eye, but mainly in the forehead and temple; and marked exacerbation occurs at night. At the commencement of the disease, the eye feels hot and dry; but this state is soon succeeded by an increased secretion of tears. There is generally, however, little lachrymation or intolerance of light. The minute sclerotic vessels are seen enlarged, radiating in straight lines, to form a vascular plexus or zone of a pink hue, around the circumference of the cornea (Fig. 29); and a narrow white line often encircles the cornea, between that membrane and the pink zone. Not unfrequently, the pupil is contracted, and incapable of its wonted activity of motion; this denotes that the iris has participated in the morbid action. The conjunctiva, too, frequently sympathizes more or less; and by its large, florid, tortuous vessels, the sclerotic characters may be in part obscured. There are often rheumatic pains in other parts of the body.

Antiphlogistic treatment is to be had recourse to, with an activity and continuance proportioned to the intensity of the symptoms. The iris ought to be placed and kept under the influence of belladonna. Mercurial and anodyne frictions should be made on the temple and brow. And the system is to be put under the influence of colchicum, iodide of potassium, guaiac, salines, or other remedies of antirheumatic virtue. Cinchona and soda, five grains of each, given three times a day, sometimes cut this disease short when exhibited at its commencement. Counter-irritation, by blisters behind the ears, is also of service. The only local application should be tepid fomentation, either simple or medicated. Occasionally, the affection is found associated with ague, and then a combination of quinia with colchicum is found of much service. Should the iris become involved, the systemic influence of mercury is to be unhesitatingly employed, conjoined with the ordinary antiphlogistic treatment proper for the cure of that affection.

Staphyloma of the Sclerotic.

This is much less frequent than staphyloma of the cornea. Generally, it is the result of inflammatory action in the choroid and change

of structure so induced. The sclerotic becomes attenuated, and yielding; the choroid coat, engorged, shines through it, and irregular bulging forwards takes place, constituting several swellings of a bluish or leaden hue. The external vessels are usually enlarged and tortuous. The bulging is often to a great extent, and consequently demands surgical interference. When protrusion takes place from between the lids, then diminution by either puncture or incision is expedient, as in the analogous affection of the cornea (p. 128). Puncturing the staphylomatous swelling from time to time, and allowing the fluid within to drain off, sometimes diminishes the size of the globe; but, if this be not effectual,

Fig. 37.

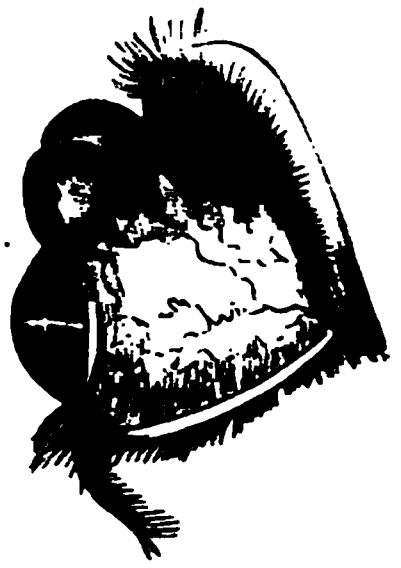


Fig. 37. Staphyloma of the Sclerotic Coat, seen in profile.

Fig. 38.

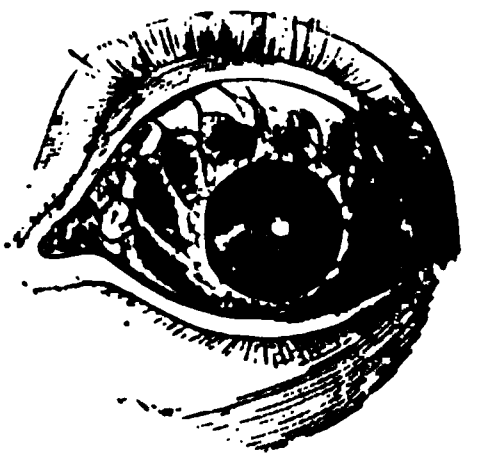


Fig. 38. The same disease, seen in front. *Staphyloma racemosum.*

the humors ought to be discharged through an incision in the cornea, or the cornea itself may be altogether removed, and then the globe will collapse, and the eye shrink to a small size. In the early stage, internal use of the arsenical solution seems to exert a beneficial influence in preventing or checking the bulgings of the sclerotic.

Affections of the Choroid Coat.

Choroiditis.

Choroiditis, though a frequent associate of iritis, sometimes evinces an independent existence. It is generally confined to one eye, and is most common in females of a strumous tendency. The early symptoms are often gradual and insidious, because chronic. Muscæ volitantes and an impaired state of vision usually first attract the attention of the patient. These slowly increase, and terminate eventually in more or less complete amaurosis.

Sclerotic vascularity is exhibited, in a faint and imperfect degree, at an early period of the disease; it soon becomes aggravated, however, and is generally more distinct at one or two points than at others. It is accompanied with a feeling of tension and deep-seated pain, often severe, and extending to the surrounding parts; the eyeball is tense and hard to the touch, and by pressure the pain is aggravated; sometimes there is intolerance of light and photopsia.

The sclerotic now becomes attenuated by absorption, assuming a dull blue or leaden hue from the dark choroid shining through it; it also becomes irregularly prominent at certain points. The pupil is dilated, irregular, and of impaired mobility; it is frequently dragged and displaced in the direction of the prominences on the sclerotic; vision is more or less impaired. Ultimately, the whole globe becomes enlarged, and staphyloma of the sclerotic takes place, the thinned coat having been pushed forwards, either by the swelling caused by the enlarged and tortuous vessels of the choroid, or by the exudation which has taken place from them. By the inward pressure, too, the retina has become more and more affected, being pressed towards the centre of the eye, where occasionally it may be seen through the pupil, in the form of a glistening or whitish cord; loss of vision is at length complete. General internal ophthalmia is not unlikely to supervene.

Treatment should consist in the abstraction of blood, both generally and locally, but more particularly in the latter way; in the early stage of the disease, the extreme vascularity of the choroid being more decidedly influenced by abstraction of blood than by almost any other remedy. In the subacute form, blood is to be withdrawn with more caution; and, in both forms of the disease, counter-irritation is of good service. Purgatives also are useful. Mercury, given so as slightly to affect the system, seems in many cases to arrest the untoward progress; but, when the malady is connected with a strumous habit, it requires to be given with great caution, and generally should be combined with quinia, iron, iodine, and the like. In such cases, nutritious diet, good air, and exercise are also beneficial. The arseniate of potash given in small doses, three times a day, has often proved beneficial in the advanced stage, when other remedies have failed. If staphyloma of the sclerotic have occurred, puncture or incision may become necessary, as already explained.

Muscæ Volitantes.

Weak vision, rendered imperfect and interrupted by opaque bodies seeming to float before the eye, is generally understood to depend on congestion of the choroid coat. The ordinary cause is over exertion of the organ, combined with sedentary habits; it is also often symptomatic of derangement of the stomach. The remedial treatment consists of moderate depletion from the neighborhood of the part, gentle purging, alteratives, careful diet, repose of the organ, bodily exercise, and ultimately tonics.

Affections of the Iris.

Iritis.

Inflammatory action in the iris may be the result of injury, or it may be of idiopathic origin; it may occur primarily, itself constituting a disease, or it may be but a part of general deep ophthalmia; it is often connected with the syphilitic and mercurio-syphilitic taints of system; unfrequently, it is of a rheumatic character.

A pink or brick-red vascular zone is seen on the sclerotic, formed by the minute subdivisions of the anterior ciliary arteries. This zone is most distinct near the edge of the cornea, and becomes gradually shaded off towards the circumference of the globe; it is more or less marked, according to the extent and stage of the inflammatory action. There is at first a distinct interspace of white between the vascular zone and the corneal margin; ultimately, this white line becomes obscured by involvement of the conjunctival vessels in the inflammation. The pupil is contracted, and much less movable than in health, under the ordinary stimulus of light. Indeed, returning mobility of this part is one of the first and surest signs of amendment having fairly begun.[1] The iris changes its hue; if of a light color naturally, it becomes greenish; if dark, it assumes a reddish-brown appearance. It is also perceptibly swollen, or thickened at

Fig. 89.

Iritis; showing the characteristic vascularity of the globe, the iris clogged with lymph, the pupil contracted and irregular.

[1] Gromelli, from the observation of successful injection, concludes the iris to be an erectile tissue. He supposes that contraction of the pupil, during the inflammatory process, depends simply on engorgement of the radiating vessels, which are fixed at the circumference, and free at the pupillary margin; and that return of the blood, in resolution, allows the iris to shrink, and the pupil consequently to expand.—*Brit. and For. Rev.* No. 29, p. 233.

[The existence of *muscular fibres* in the human iris, as the cause of the contraction and dilatation of the pupil, long suspected, has been recently satisfactorily proved by Mr. Lister, of England. An interesting account of his investigations upon this subject is contained in the first No. of the *Quarterly Journal of Microscopical Science.*

Mr. Lister has shown that a distinct sphincter and also a dilator muscle may be recognized. Their structure belongs to the unstriped variety of muscular tissue, consisting of elongated fibre-cells containing elongated nuclei, and collected in bundles. After stating the mode of examination, and the dimensions, and other physical properties of these elements, Mr. Lister remarks that "the *sphincter* muscle is readily seen, while the *dilator* is that whose investigation alone presents very serious difficulty. In the first iris that I examined with a view to the distribution of the muscular tissue, I was struck, after removing the usual pigment, with the appearance of a band on the posterior surface of the iris, near the pupil, and parallel to its margin, quite evident to the naked eye, elastic, and highly extensible. This proved to be the thickest part of the sphincter pupillæ. I have examined six human irides with reference to the distribution of the muscular tissue, but in none have I had any difficulty in recognising the sphincter, which I have also found equally distinct in some lower animals, viz., in the rabbit, the guinea-pig, and the horse. In man I find it about 1-30th of an inch in width, thickest towards its outer part, where it lies nearer the posterior surface of the iris than the anterior, and thinning off towards the pupil, where it forms a sharp margin, covered apparently on its anterior aspect only by some vessels and nervous threads and a delicate epitheliated membrane, which is thrown into beautiful folds when the pupil is contracted. The fibres of the sphincter are not absolutely parallel, and this deviation is probably produced in part by the dilating fasciculi sweeping in at various parts in a curved manner, and becoming blended with the sphincter. By teasing out under the microscope a portion of the actual pupillary margin, I found the sphincter to consist at this part of apparently unmixed muscular fibre-cells, without any connecting cellular tissue," &c. (*op. cit.* p. 18.) "On teasing out portions of the *outer* part of the human iris, I have found long delicate fasciculi, whose faint outline, absence of fibrous character, and possession of well-marked elongated nuclei parallel to the direction of the fasciculus, left no doubt in my mind that they were plain muscular

its pupillary margin; sometimes it is seen of increased vascularity, and bulging forwards in the anterior chamber. The eye is painful, intolerant of light, and there is increased lachrymation; pain is felt in the brow, temple, and head, and undergoes marked nocturnal exacerbation. Sight is greatly impaired.

As the disease advances, these symptoms increase. The aqueous humor becomes turbid. Plastic deposition takes place from the surface of the iris; sometimes coating it with a thin layer, sometimes studding it with nodulated points; sometimes diffused in the anterior chamber; often and most frequently situate at the free margin of the iris, hanging pendulous in fringes from the circumference, forming a delicate network stretched across, or perhaps completely blocking up the already contracted pupil. And at this stage, if not before, the contracted pupil is found to be irregular in form, in consequence of adhesions having taken place between it and the capsule of the lens; an irregularity, which becomes especially distinct when partial dilatation has been effected by belladonna. Extravasation of blood from the surface of the iris may occur; small clots are sometimes to be seen resting on it; or the blood may gravitate to the bottom of the anterior chamber, and accumulate there, constituting the state termed *Hypoæma*. Or effusion of pus into either chamber may take place. The pus forms small abscesses on the iris, which soon give way and discharge their contents; and, gravitating to the bottom of the anterior chamber, it collects there, constituting *Hypopion*. Such events indicate an intense action; not only likely to prove most prejudicial to the delicate texture involved, but also almost certain to extend to those adjoining.

The result of fibrinous exudation is denoted by various terms, according to its extent and site. When fibrine blocks up the pupil permanently, the case is termed one of *False Cataract*. When adhesion has formed between the posterior surface of the iris and the capsule of the lens, it is termed *Synechia posterior*. When the iris, bulging forwards, has reached the posterior layer of the cornea, and become adherent thereto, the term *Synechia anterior* is applied. After a time, the vascularity of the organized fibrine can often be distinctly seen, when a strong light is thrown upon the part.

During active advance of the inflammatory action the system sympathizes to a considerable extent; there is often a marked form of inflammatory fever.

Treatment.—Our principal object is to arrest the progress of the

tissue." (p. 14.) This is more clearly demonstrated in some of the lower animals, particularly in the horse; in which "the dilating fasciculi appear to consist of precisely the same tissue as the sphincter, and to blend with it in their insertion." (p. 15.) "In the human iris I have seen a muscular fasciculus, as it appeared from the nuclei it contained, crossing the sphincter at right angles for a short distance; this observation, so far as it goes, seems to imply that the same mode of insertion of the dilator occurs in man as in the horse. The fibre-cells of the dilator appear to be held together much more closely than those of the sphincter, at least in the outer part of the iris; for I have never been able to define the individual fibre-cells in a perfectly satisfactory manner in the dilator, though I have often traced out portions of the outer part of the iris. The dilating muscular tissue is also probably less abundant than the muscular tissue of the sphincter; and this, if the fact, will help to account for the comparative difficulty in discovering it," &c. (p. 16.)—Ed.]

disease at an early period, ere exudation or structural change has taken place, in order to avert all hazard to the important part, if possible. Our remedies ought to be early, active, and powerful. Blood should be abstracted freely, both generally and locally. The eye is kept dark or shaded, and should be frequently fomented. The bowels are freely moved; and then, as rapidly as possible, the system is brought under the full influence of mercury—unless there be some pre-existing and undeniable contraindication; for in general it is not till the mouth is affected mercurially, that the disease begins to amend. If the system, however, be strumous, and consequently intolerant of mercury—or when there is a known idiosyncrasy rendering all exhibition of the mineral dangerous by the induction of erethismus—then a substitute must be sought, likely to aid general antiphlogistics in preventing exudation, or in causing its absorption. Turpentine is often a valuable remedy for this purpose, when given in full and continued doses;[1] but it is not always to be trusted to alone; it seems to act better when a small quantity of mercury has been previously given, and then its use frequently proves beneficial, not only at the time, but also in preventing relapse of the disease. From the first, belladonna is applied, so as to oppose the tendency to contraction in the pupil, and effect dilatation if possible. The semifluid extract is smeared on the eyebrow and temple, or an aqueous solution may be dropped between the eyelids; but the former method of application is usually preferred, at least in the first instance. In those cases in which mercury is not contraindicated, mercurial friction on the temple and forehead is advisable, to maintain the constitutional effect which internal exhibition of the mineral has produced. In the more chronic form of the disease, counter-irritation may take the place of the direct antiphlogistics. And, ultimately, when traces of the affection still linger, the internal administration of tonics, especially of quinia, proves beneficial by dissipating the state of passive congestion which threatens to remain.

When *Hypopion* has formed rapidly, and when the purulent accumulation is considerable, it has been proposed to make an opening at the lower part of the cornea, by means of a cataract-knife, so as to effect evacuation. This, however, is dangerous; it is better to trust to the sorbefacient powers of mercury, than to encounter the risk of aggravated inflammatory action.

The extravasated blood of *Hypoæma* should receive the same treatment. Active antiphlogistics are had recourse to; and these having told favorably on the action, the extravasated blood may be expected to disappear gradually by absorption. The occurrence of *Hypoæma*, however, as indicating a high degree of inflammation, is always of bad omen.

The adhesions, or *Synechiæ*, are superable in the recent state. By perseverance in the local use of belladonna, the imperfectly organized

[1] Mr. Carmichael's Formula is as follows: Recipe, Ol. Terebinth. rect. unc. unam; Vitel. unius ovi; Tere simul, et adde gradatim, Emuls. Amygd. unc. quatuor; Syrup. cort. aurantii unc. duas; Spir. Lavend. comp. drachmam, c. semisse; Olei Cinnamomi, guttas quatuor. M.——— Dosis, unc. un. ter in die.

fibrine is extended or torn, and the iris recovers its normal play. At the same time, absorption of the deposit is to be favored, by moderate continuance of the mercurial friction.

Syphilitic Iritis is a frequent variety of the affection, occurring as part of the secondary train of venereal symptoms. Its characteristics are: the accession along with other venereal symptoms; marked nocturnal exacerbations; a dark hue of the vascular zone; fibrinous deposit occurring in nodules of a brownish hue, studded on the margin of the pupil as well as on the surface of the iris; and the margin of the pupil often observed to be thickened, and corrugated. This form generally is more severe, and runs its course more quickly, than the idiopathic variety of iritis. Treatment is as for ordinary examples of the disease.

The *Rheumatic and Arthritic Iritis* is not of such frequent occurrence. It is characterized by: accession taking place along with other symptoms of a rheumatic or gouty character; the vascular zone is of a purplish hue, and not a little obscured by early involvement of the conjunctival vessels; the whitish ring surrounding the cornea is more perceptible in this species of iritis than in any other; the pupil, contracting, inclines to assume an oval form; and there is peculiar proneness to relapse. Treatment consists of the ordinary antiphlogistic remedies directed against acute and inflammatory rheumatism. Mercury should be given cautiously, and often requires to be combined with quinia as a tonic; in many cases its place may be advantageously taken by colchicum, guaiac, or iodide of potassium.

Strumous Iritis frequently results from extension of the inflammatory process inwards, in cases of strumous corneitis, and is the form of iritis most generally met with in childhood. The previously existing opacity of the cornea is very liable to mask the internal and more important action; deceiving the practitioner as to its existence, until the opportunity for successful treatment has passed. Mercury should be used very sparingly; and, at a comparatively early period, the administration of quinia, iron, iodine, &c., with a tonic regimen, is required.

Changes in the Pupil and Iris.

Unusual dilatation of the pupil is termed *Mydriasis.* It may be of idiopathic origin; or it may be connected with disorder in the cerebral functions; it is a common symptom of Amaurosis; and frequently it is caused by contusions; often it is sympathetic of intestinal irritation. The admission of an excess of light to the retina is found to be a serious inconvenience; and vision is confused and impaired accordingly. The remedial treatment consists in detection of the cause; removal of this, if possible; and subsequent stimulation of the part, by frictions on the temple and brow, and by exposure of the eye itself to ammoniacal vapor. Electricity and galvanism are also sometimes useful. In the idiopathic forms of paralysis of the iris, M. Serres recommends cauterization of the corneal margin by nitrate of silver. In other cases, palliation results from contracting the space for admission of light, by spectacles

darkened except at a small opening in the centre, as in the case of conical cornea (p. 129).

When dilatation of the pupil accompanies amaurosis, of course it cannot be expected to disappear, unless the amaurotic condition have been previously removed.

Myosis denotes unusual contraction of the pupil. This is one of the consequences of iritis, as we have already seen; it may also attend on disorder of the cerebral functions; sometimes it is induced by habitual straining of the eye on small objects—as in microscopists, engravers, watchmakers, &c. Ordinary and useful vision is necessarily impaired. The means of cure consist in removal of the cause. In the artificers just enumerated, temporary abstinence from the usual avocations will often suffice to restore the normal state.

Tremulous Iris.—A trembling, or oscillatory movement of the iris, not unfrequently accompanies amaurotic affections; and seems also, in most cases, to be connected with softening of the vitreous humor. It is but little amenable to treatment; and is chiefly notable as a sufficient contraindication of operative interference, in connection with cataract and artificial pupil.

Adhesions of the Iris—Synechiæ—have been already considered (p. 135). They may be the result of wound, of corneitis, or of iritis. In synechia anterior, complete, and accompanied with opaque cornea, cure is manifestly hopeless. When incomplete, and the cornea clear, amendment by the formation of an artificial pupil is within our power. When the adhesion is partial and recent, it may sometimes be remedied by mercurials, and the use of belladonna. Similar treatment will avail in synechia posterior, when recent and partial. But, when complete, it is usually accompanied with opacity of the crystalline capsule, and it may be of the lens itself; under such circumstances, amendment of vision can be effected only by an operation directed against the cataract.

Occlusion of the Pupil.

The pupil may be closed in various ways. Remaining itself in a normal state, it may be obscured by the cornea which has become simply opaque, or opaque and staphylomatous. Or, the cornea remaining clear, the iris may contract during inflammatory action, and the pupil may become occupied by organized fibrinous deposit. Or both iris and cornea may undergo serious structural change; as when complete synechia anterior takes place in staphyloma. In the last-mentioned case, restoration of sight is manifestly impossible. But in the other examples, something may be done by forming an *Artificial Pupil.*

Before proceeding to any such operation, however, certain circumstances are invariably to be taken into consideration. It must be ascertained—that the adhesions of the iris are irremediable by the influence of mercury and belladonna; that the opacity of the cornea is permanent; that the other parts of the visual apparatus—especially the retina and vitreous humor—are in a sound and healthy condition; that the eye has not only ceased to be the seat of all inflammatory action, but, also, that it is not prone to resume such action on the application of a fresh

exciting cause. An operation is also very properly held to be inexpedient, so long as the patient enjoys a tolerable degree of vision with the other eye; and it is plainly contraindicated, when one eye only is affected.

Three distinct modes of operation are practised; all implying division of the iris—so as to make a sufficient gap in it—opposite a clear portion of the cornea. The desired space in the iris may be obtained by incision, excision, or laceration. Accordingly, the operation is said to be by *Coretomia*, *Corectomia*, or *Coredialysis*.

The situation of the proposed new pupil requires consideration. The centre of the iris is the best position; but when this is impracticable from central opacity of the cornea or other cause, the nasal side is to be preferred; or it may be made on the temporal or lower sides. When made above the centre, it is apt to be covered by the upper eyelid.

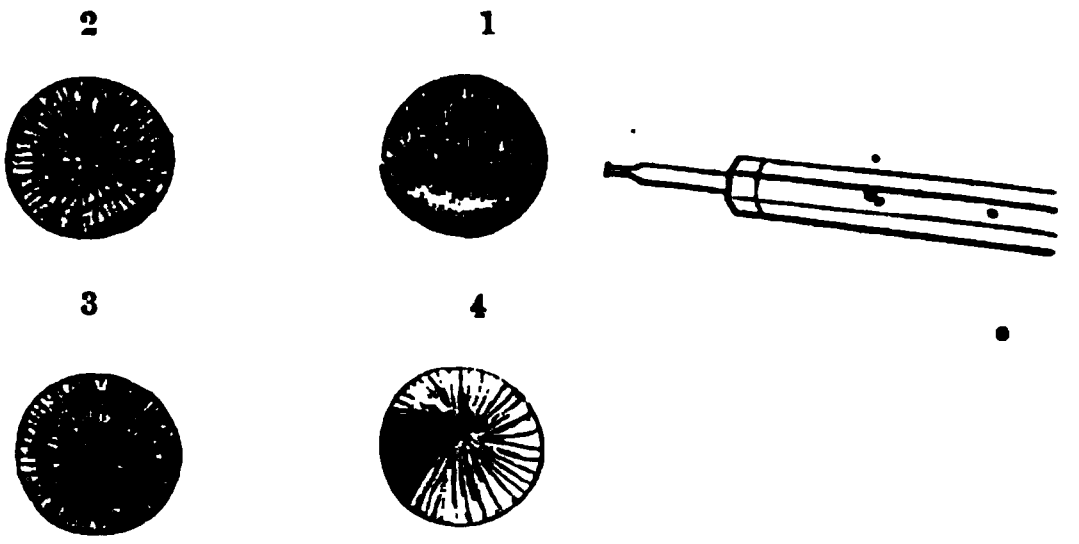
The patient, by previous preparation, should be placed in a condition favorable to the avoidance of inflammatory action.

Fig. 40.

[The Iris-Knives of Sir William Adams. *c*. One less than a line in width. *d*. One still narrower. (From Lawrence.)—Ed.]

Coretomia, or incision, is performed in cases where the greater portion of the cornea is clear, and the iris is apparently in a state of tension, with the pupil

Fig. 41.

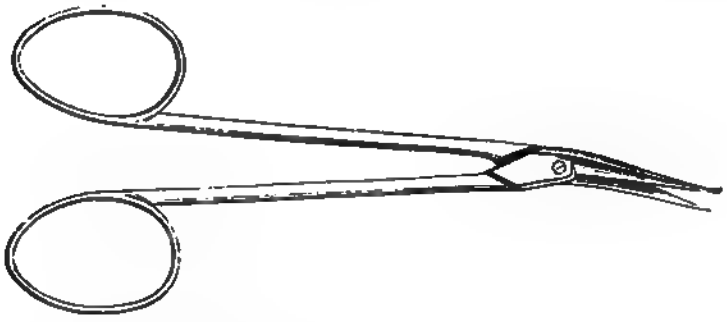


1. Coretomia through the sclerotic. The knife introduced—rather far back. 2. Coretomia through the cornea, showing the lines of the incisions. 3. The same after the operation. 4. Coredialysis, or separation. (From Wharton Jones.)

closed. It may be performed either through the sclerotic or through the cornea. In operating through the sclerotic, an iris-knife is introduced through this membrane about a line from its junction with the cornea, as in the operation for cataract, and the point of the knife is made to pierce the iris at about a line from its temporal margin; the instrument is then carried across the front of the iris in the anterior chamber, to the nasal side of the cornea (Fig. 41, 1); and, while it is withdrawn again, gentle pressure should be made with its edge upon the iris, the tense fibres of which when divided will separate, and an elliptical or ovoid pupil will be the result. The fibres of the iris should be divided for about a half of the diameter of the membrane. When the lens is opaque, as is generally the case, it should be broken up at the same time.

In operating through the cornea, a method practised by Maunoir, an opening is made in this membrane by a cataract-knife, involving about a third of its circumference; into this aperture a pair of fine scissors is introduced, the pointed blade of which is thrust through the

Fig. 42.



[Maunoir's Scissors; so delicate that the thickness of the two blades united does not exceed that of an ordinary probe. (From Lawrence.)—Ed.]

Fig. 43.

Tyrrell's Blunt Iris Hook.

iris, while the blunt one is carried between that membrane and the cornea. The scissors are pushed on, till their farther progress is arrested by the junction of the cornea with the sclerotic, when their blades are brought together, and the iris is divided as in the former instance. Or, another incision may be made with them, diverging from the first, and including a triangular portion, the apex of which is near the centre of the iris. The flap so formed will shrivel up in the direction of its base, and leave a sufficient opening for the admission of light (Fig. 41, 2 and 3).

Corectomia, or excision, is performed through the cornea, in cases where a portion of that membrane is opaque. When the pupil is non-adherent, and only the centre of the cornea opaque, a broad flat needle, or the point of a cataract-knife, is passed into the anterior chamber at the lower or outer side of the cornea; through this aperture Mr. Tyrrell's fine blunt-hook is introduced, and having been entangled over the free margin of the pupil, is withdrawn through the opening; the included portion of iris being either excised with scissors, or allowed to rub off with the friction of the lids, after having become strangulated in the wound of the cornea.

Fig. 44.

Extensive Opacity of the Cornea. A portion left clear, suitable for an artificial opening in the iris, by corectomia.

Fig. 45.

Corectomia.

When the pupil is adherent either to the capsule of the lens, or to the cornea, a larger incision than in the former case should be made, near the junction of the cornea with

the sclerotic, and through a clear portion of the cornea. The aqueous humor escapes, and is generally followed by a protrusion of the iris, which should be increased by gentle pressure on the globe; or a portion of it may be dragged out of the opening by a small hook; and when a sufficiency has been protruded, it should be excised with the curved scissors. Sometimes it is necessary to separate the adhesions with a needle, before the iris will prolapse. A portion of the pupillary margin should, if possible, be included in the excised part.

Fig. 46.

[Sharp Iris-hook. (From Lawrence.)—Ed.]

Coredialysis, or separation, is performed when the cornea is opaque, except a small part at its circumference. Having made an opening about two lines in length through the opaque membrane, a fine sharp hook is introduced, which is fixed in the iris close to its ciliary border, and behind the clear portion of the cornea. When the hook is withdrawn, the iris is torn away from its ciliary attachment till an opening of sufficient size is obtained (Fig. 40, 4). The portion of the iris which is drawn out of the anterior chamber, may either be allowed to become strangulated in the edges of the incision, or it may be excised.

This operation may also be performed by introducing a curved cataract-needle through the sclerotic, and carrying it across the posterior chamber, till it reaches that portion of the iris which it is wished to separate from its ciliary attachment; here it is made to perforate the iris, and separation is effected by pressing the point downwards and outwards.

[Dr. Hays, of this city, performed, in 1841, an operation which differed from those above described. The cornea was densely opaque in the centre, but perfectly clear below, excepting a few very minute points where it had been burned by grains of gunpowder; the upper edge of the pupil adhered firmly to the cornea. The operation consisted in incising with a cataract-knife the cornea near its junction with the sclerotica, commencing a little below the middle, and extending the incision so as to divide nearly one-fourth of the circumference of the cornea. The knife was carried steadily and quickly forward, so that the aqueous humor should escape with a gush, and carry the iris before it to the incision, and that subsequent adhesion should take place between the iris and the latter—all of which did occur, and excellent vision was secured to the patient.

If the iris should not prolapse readily, it may be drawn down by a hook, as done by Himly, or pressure may be made upon the eyes from above.—*Lawrence*, Am. Ed. pp. 455–7.—Ed.]

There is generally a considerable quantity of blood effused into the anterior chamber after all of these operations, and more or less inflammatory action follows. Strict antiphlogistic treatment should be pursued, with confinement in a dark room. It is to be remembered that the new pupil, on its first formation, should seem rather too large than otherwise; there being always a decided tendency to subsequent contraction.

Affections of the Retina.

Retinitis.

The acute form of this affection may follow direct injury by wound, or the pressure of a depressed lens, or exposure to intense light or heat, or undue and continued exertion of the eye; or it may be of idiopathic origin. It is accompanied with agonizing pain, deep-seated, shooting through the head, aggravated by the slightest motion, and often with delirium. There is very great intolerance of light, with lachrymation; luminous bodies seem to pass before the eyes; vision is greatly impaired from the commencement; the pupil is at first much contracted, but afterwards becomes dilated, and remains motionless. Then the intolerance of light abates, and blindness becomes complete—the retina being no longer capable of obeying the accustomed stimulus. The system is involved in marked inflammatory fever. At first, the outward indications of increased vascularity are not very apparent; but, ultimately, as the action extends to the other deep textures of the eye, the usual signs of internal ophthalmia become developed.

Treatment, which should be decidedly antiphlogistic, consists in seclusion from all stimulus of both the eye and system; bleeding, both local and general, repeated if need be; purgatives; counter-irritants; and free exhibition of mercury, so as to exert its full influence on the system. Mere abatement of the acute symptoms is not sufficient; therefore, the remedies ought to be persisted in till a perfect cure is established; due regard being paid to the safety of the patient. If the disease be allowed to degenerate into a chronic form, it will ultimately prove injurious to the function of sight.

Amaurosis.

By this term is understood impairment of vision, more or less complete, dependent on change in the retina, optic nerve, or brain; and that change may be either structural or functional. In the latter case, there is good hope of cure by suitable treatment; in the former, even palliation is often hardly within our power.

The causes are: change in the retina, optic nerve, or brain, by the inflammatory process, acute or chronic; compression of these parts in any way—as by extravasated blood, inflammatory effusion, or formation of a tumor; a congested state of these parts, induced by over-exertion of the eye or brain, by irregularity of bowels, by habitual exposure to much light and heat, by intemperance, by gout—by, in short, whatever tends to cause determination of blood to the head. Sometimes, on the contrary, amaurosis is caused by want of the circulating fluid in the eye or in the head; as in cases of anæmia from prolonged lactation, profuse uterine discharge, or the like. Wounds of the supraorbital branches of the fifth nerve have often been followed by amaurosis.

The symptoms are: impairment of vision, gradual and increasing; at first there is, perhaps, mere obscuration of sight, but this soon gives place to thorough perversion of that function; objects are often seen of

erroneous proportion and color. In the congestive and inflammatory forms, more or less pain is complained of. At first, there may be intolerance of light; but, ultimately, a glare is borne with impunity, or is rather desired than otherwise. Ocular spectra are seen, either constantly, or from time to time, especially after exertion of the eye; they may be dark or luminous, massy or scintillated, steady or flickering. The pupil is dilated; the iris is sluggish, and ultimately motionless; the eye has a vacant, staring expression; and the patient acquires a peculiar, uncertain gait. Often, there is no fixed or decided pain in the part; but rather a sensation of tension and uneasiness. Sometimes the eyeball has a tremulous or oscillatory motion. On the whole, the ordinary and characteristic symptoms are, the painful sensations, the impairment and perversion of vision, the ocular spectra, and the state of the pupil. In applying the catoptrical test (p. 144), the three images of the candle are seen as in the healthy eye—a sufficient distinction from both glaucoma and cataract. From the latter, it is farther distinguished by vision being improved in strong light, and impaired by belladonna; by the state of the pupil; by the absence of crystalline opacity; by perversion of sight existing—not mere impairment; and by the characteristic stare and gait of the patient.

But there is no uniformity as to symptoms. In most examples, pain ceases on full establishment of the disease; in others, it continues unabated. In most, the symptoms gradually advance to complete loss of sight; in others, independently of treatment, the symptoms reach a certain point, and then remain stationary. One patient may continue to have intolerance of light throughout; the majority of advanced amaurotics, on the contrary, seek a strong light, finding their vision improved thereby. Some see objects double; this variety is called *Diplopia*. Others see but the half of an object; and this is termed *Hemiopia*. In many, the pupil is at first contracted, there being an originating inflammatory process present; in most, ultimate and permanent dilatation exists; but, in a few cases, the iris seems natural in both form and hue, and is perfectly obedient to the stimulus of light.

The untoward progress is very various. Sometimes vision is lost at once, as when extravasation takes place by sudden congestion. Sometimes months elapse, or even years may be occupied in the gradual decay. The affection is most common in the middle period of life; and while it seldom attacks both eyes at once, both are ultimately involved in the great majority of cases.

In the inflammatory form, the mode of treatment is plain; the ordinary antiphlogistics are demanded in cases which are at all acute; and the system ought to be brought, and maintained for some time, under the influence of mercury, which often evinces a striking control over the disease. In the chronic examples, moderate depletion, followed by an alterative course of mercury, is most likely to prove useful; and counter-irritation is at the same time advisable. When congestion is suspected, moderate depletion should be practised with purgation; and then the ordinary means are to be taken for preventing local determination of blood. If the affection have followed disappearance of an accustomed discharge, normal or not, return of that discharge is to be sought.

If an atonic state of the system exist, a stimulating plan of constitutional treatment is plainly indicated. If the disease be apparently but a secondary symptom, as it were, of some constitutional malady, as jaundice or hysteria, that malady is to be thoroughly eradicated from the system, if possible. If intestinal irritation exists, or be suspected, it is to be treated by the ordinary means. In short, the predisposing and exciting causes should, if possible, be ascertained and removed. And this paramount indication having been more or less perfectly fulfilled, certain means are sometimes in our power whereby to rouse the retina to a resumption of its function. Stimulants, when applied directly to the eye, or to its neighborhood, are sometimes useful for this purpose; or the endermic application of strychnia may be made on the temple or forehead. A blister having been applied, a quarter of a grain of the powder is sprinkled on the part, once or twice a day. The dose is gradually increased, until a bitter taste is felt in the mouth, and then temporary discontinuance of the remedy is expedient. Failing strychnia, electricity may be employed, but its use is seldom attended with much benefit.

Affections of the Crystalline Lens and Capsule.

Cataract.

The term *Cataract* is applied to opacity of the crystalline lens. It is said to be *lenticular*, when the disease is situated in the lens itself; *capsular*, when the capsule only is opaque; and *capsulo-lenticular*, when both the lens and its capsule are affected. The affection may occur at any age, and is said to be owing to "defective nutrition from the changes which are going on in the vascular or lymphatic system." Or it may be induced by external injury of the part. Sometimes it is a congenital defect. Most frequently, it occurs in advanced years; one sign, among many, of the frame's gradual decay.

The prominent symptom is impairment of vision. At first, objects are seen as if obscured by a gauze or mist; this obscuration gradually increases; and ultimately vision is almost, but not entirely, lost. Sometimes uneasy sensations are complained of in the eye and forehead; more frequently the part is the seat of no abnormal sensation. Sight is improved by a diminution of light; it is better at twilight than at noon, and also better when the patient is seated with his back to the light than when facing the window; for the pupil, then dilating, permits the rays of light to pass to the retina through the margin of the lens, which is as yet unobscured. For a like reason, the use of belladonna materially improves the sight. On looking into the eye, an opacity is discernible, occupying the pupil, and situate immediately behind it. Whenever deliberate examination is contemplated, belladonna should be previously applied, to dilate the pupil, so as to afford every facility for ascertaining the extent and character of the opacity. In proportion as sight is impaired, the opacity is found to have increased. It is greatest at the centre; when complete, it is of a gray, white, bluish, or amber hue; and this is not unfrequently contrasted

with a dark annulus or ring on its exterior—the shadow of the iris falling on the periphery of the cataract. In the most advanced cases, the patient is still able to distinguish light from darkness. The iris is not necessarily impaired in its functions. Both eyes are seldom attacked at once; but usually both are ultimately involved.

What is termed the *catoptrical test* of cataract is conducted thus: The pupil having been dilated by belladonna, the patient is seated with his back to the light, and the surgeon holds a lighted taper in front of the eye. In a sound organ, the depth of the clear pupil exhibits three reflections, or images, of the light; one superficial, bright, and distinct, caused by reflection from the cornea; one deep-seated, pale, and indistinct, caused by reflection from the anterior portion of the lens; and one in the mesial plane, or between the two former, small and obscure, caused by reflection from the posterior portion of the lens; the first two, erect, move consentaneously with the lighted taper; the last mentioned, inverted, moves slowly, and in an opposite direction. In the case of cataract, the middle inverted image is first extinguished; and, afterwards, the deep erect one also becomes invisible. Or, to speak more accurately, "opacity of the posterior capsule prevents the production of the middle inverted image; and opacity of the anterior capsule destroys the two posterior ones. In other words, in posterior capsular cataract, the middle or inverted image is not seen; in cataract of the anterior capsule, and in capsulo-lenticular cataract, the anterior straight one only is visible." In amaurosis, the three images are always distinct, as in the sound eye. "Glaucoma, only when much advanced, obliterates the inverted image; while, in all its stages, it renders the deep erect one more evident than it is in the healthy eye."

[In order that the catoptrical test shall be successfully applied, the room should be darkened, the only light in the apartment being that of the candle in the surgeon's hand; and, moreover, his own eyes should be screened, so that the glare from this shall not interfere with his examination of the eye.—Ed.]

From glaucoma and amaurosis cataract is farther distinguished by the state of the pupil, the site and character of the opacity, the nature of the vision, and the expression and gait of the patient.

Spurious Cataract is said to exist when organized fibrine occupies the pupil. This is distinguished from true cataract by being of a yellow or whitish color, and by the lens being adherent to the iris, which is puckered, altered in hue, and irregular in its pupillary margin.

[The term *Spurious Cataract* must also include such opacities as are produced by disease or injury, causing the exudation of pus or blood into the chambers of the aqueous humor, or turbidity of this fluid; also, the deposition of the uvea pigment upon the capsule of the lens. But the expression is a bad one, as it conveys false ideas of the actual pathological state, and should not be applied to the conditions just enumerated; the latter, on the contrary, should be designated each by its proper name.—Ed.]

Cataracts vary as to density. Hard cataract is most frequent in the old, and is characterized by its brownish or amber tint. The lens is apparently shrunk in its dimensions, and the greatest amount of opacity

is central. The iris is free and movable; the dark ring surrounding the cataract is remarkably distinct, and in the twilight, as also after the use of belladonna, objects may often be discerned with tolerable accuracy. *Soft* cataract, of fluid or semifluid consistency, is large and bulging, and completely occupies the pupil. It is most common in the young and middle aged, and is characterized by its bluish-white or milky color. The iris is clogged in its movements, from the increased size of the lens, and the impairment of vision is great. The opacity is not always homogeneous, dots or streaks are occasionally observed on it, and these may change their form and site from time to time. In what is termed the *Radiated* Cataract, the opacity is formed in streaks, and not unfrequently commences at the circumference, thence extending towards the centre. This peculiarity is readily observed on inspection, and, as can be easily understood, vision will for some time prove better with a contracted than with a dilated pupil.

[The term *Morgagnian Cataract* is sometimes employed to designate an opacity of the lens, supposed to be caused by an increase in the quantity and an alteration in the quality of the aqua Morgagni. But it has been satisfactorily determined, by recent capable observers, that the fluid of Morgagni does not normally exist between the lens and the capsule. Mr. Bowman states in his *Lectures*, already quoted from, that "when this fluid exists in the cataractous lens, between the body and the capsule, or when it is found there after death, it is to be regarded as a morbid or false condition, indicative of the destruction of the layer of cells which exist immediately within the capsule, separating the latter from the superficial fibres of the lens, but forming an organic union between the two, and constituting the medium through which the nutrition of the fibrous part is conducted. It is therefore to be regarded as a variety of the *Soft Cataract.*

It is of rare occurrence; it sometimes forms rapidly, as stated by Beer, who believed that it results only from the immediate influence of mineral acid or other irritative vapors on the eye (*Lawrence*, Am. Ed. p. 621); it does, however, form more slowly, and without any such cause.

Mr. Dalrymple, in his recent work on the *Pathology of the Human Eye* (description of plate 26), gives the following excellent account of this affection: "Fluid cataract is met with at all ages, but is a somewhat rare species. It appears to consist of disintegration of the lens, and when it occurs in elderly persons, the nucleus of a hard lens is often found in the interior of the capsule. This latter investment may or may not be also opaque. When the capsule is entirely transparent, it will generally be seen on dilating the pupil; and if the eye has been a short time at rest, the color is not wholly uniform; that at the lowest part the opacity is dense, while a certain degree of milky translucency is apparent at the upper part. If the eye be suddenly rolled about or rubbed, the opacity becomes general and uniform, but clears in the upper part by rest and subsidence of the more opaque materials of which it will be found to be composed. It is by this means that we distinguish a fluid from an ordinary soft cataract. On examining the contents of the capsule, when we have the somewhat rare opportunity

of doing so, we find the fluid semi-opaque, containing the débris of the lens, which may easily be distinguished by the microscope; also many oil-globules and some plates of cholesterine. In old subjects, as I have before said, the hard yellow nucleus will be found, having resisted the disintegrating process or softening of the lens." A curious peculiarity connected with this variety of cataract, noticed by Mr. Dalrymple, Mr. Wilde, and others, is, that if the capsule be opened and the morbid fluid be allowed to remain in the chambers of the eye, the patient is soon seized with violent pain, nausea, and vomiting, and, if the fluid be not evacuated, severe inflammation comes on speedily. An interesting paper on this subject by Mr. Wilde, may be consulted with advantage (*Med. Times and Gaz.* Oct. 2, 1852).

Capsular cataract may be anterior or posterior, or both. In texture and structure the capsule is so different from the lens, that opacity of the former can generally be easily distinguished from this condition of the latter. In the capsular, the opacity may commence at any part of the membrane, not in the centre, as in the lenticular cataract; it is not uniform, but spotted or striated, and of a chalky or pearly color, and more or less glistening, instead of being of an amber hue. The position, too, of the opacity is different, being nearer to the pupil in the capsular than in the lenticular.

Posterior capsular cataract may be distinguished from the anterior by the position of the opacity, by the color being more yellowish and less glistening, in consequence of being seen through the lens, and by the application of the *catoptric test.*

Very commonly the capsular and the lenticular opacities are combined, the symptoms being a blending or combination of the two.—Ed.]

Treatment.—Unfortunately, our art has as yet proved impotent in attempting to stay the progress of advancing cataract, and, when it has fairly formed, no faith need be reposed in any attempts at simple discussion of the opaque structure. By operation only can amendment be obtained. The obstructing body may be wholly extracted from the eye, or it may be pushed out of the axis of vision, or it may be broken up into fragments, which are expected to be afterwards absorbed, or it may be simply drilled, or it may have its capsule opened, so as to admit the aqueous humor, and thus favor absorption of the crystalline substance. Before any operation, however, is undertaken, certain preliminaries require to be adjusted, as in the case of Artificial Pupil (p. 137). We must first be satisfied that the eye is in other respects sound, so that when the obstruction to light is removed there may be a fair prospect of vision being restored. There must be no amaurosis, glaucoma, change in the vitreous humor, ophthalmia, or affection of the eyelids. The patient must be free from any marked constitutional ailment. The state of the atmosphere should be mild and favorable. While there is a tolerably useful amount of vision enjoyed by either eye, it is more prudent to refrain from operation, the results of operation being found most favorable in cases well matured. One eye only should be operated on at a time. Finally, by careful regimen, and medicinal treatment if necessary, the system is brought into a favorable state, and is rendered not morbidly susceptible of inflammation.

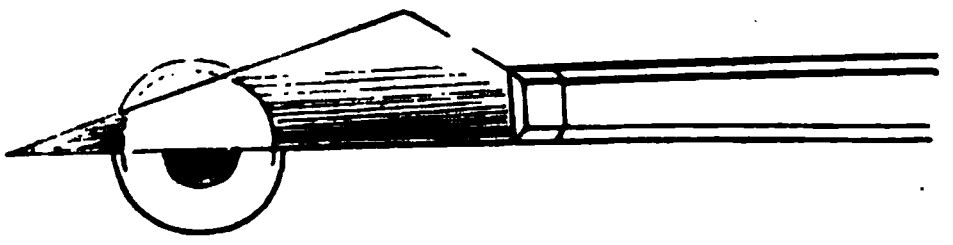
In the congenital variety an operation should be performed early, otherwise the unsteady rolling motion which the eyeball is so prone to assume, will prove an impediment to subsequent interference, and to the successful result of operation.

Extraction.—In the operation by extraction, the opaque lens is removed from the eye through an aperture in the cornea, an operation necessarily comprehending a considerable extent of wound, and no slight amount of injury done to the parts. If inflammatory action can be prevented, the result is often most successful. But if inflammation supervene, or an accident happen to the vitreous humor during the operation, sight is lost irretrievably. Many favorable circumstances require to be present to warrant an attempt at extraction. The cornea should be sound, the anterior chamber of proper size, the iris mobile and non-adherent, the globe prominent and steady, the cataract lenticular and hard. The patient should be in good health, neither plethoric and inflammatory, nor weak and incapable of plastic exudation, capable of self-control, and of maintaining the supine posture, not troubled with cough, sneezing, or asthmatic ailments. And this series of qualifications necessarily limits the operation by extraction to a minority of the cases of cataract.

The pupil should not be dilated, otherwise escape of the vitreous humor is favored. The patient is placed before a steady light, but with his head slightly inclined from it, and either seated or recumbent; the sound eye may be covered by a bandage. The surgeon, holding the knife in his right hand, should be placed either in front or behind, according to the eye which is to be operated on. An assistant now opens one lid, with his fore and middle finger, at the same time steadying the eyeball by a little gentle pressure; the surgeon opens the other eyelid, and assists in steadying the globe, by the fingers of his left hand. If the patient sits, his head is secured against the lower part of the assistant's chest. The flap may be made superiorly or inferiorly, according as it is the right or left eye which is to be operated on. It is usually made superiorly when it is the right eye, the surgeon standing behind, and elevating the upper lid himself; when it is the left eye, the flap is made inferiorly, the surgeon being seated before his patient, and depressing the lower lid, while the assistant raises the upper.

The knife used is the triangular one, known as Beer's. It should be held lightly between the thumb and points of the fore and middle fingers,

Fig. 47.



Extraction. The knife cutting through.

the ring and little fingers resting upon the cheek. The flat edge of the point is first made to touch the cornea gently, in order to reassure the patient, and secure steadiness of the organ; it is then entered at about

a line from the corneal margin, and passed into the anterior chamber in a perpendicular direction, lest separation of the corneal laminæ should take place from the knife getting between them. Penetration having been effected, the direction is changed, and made parallel to the surface of the iris; the knife is then pushed steadily across the anterior chamber, the point emerging at a spot directly corresponding to that of its entrance; and the steady advance of the instrument is continued, until section of the cornea is complete. All pressure is now to be removed from the eyeball. If the aqueous humor escape prematurely, the iris falls forward, and is consequently brought into contact with the edge of the knife. In this case a stop is made, and gentle pressure must be applied to the cornea yet uncut, without however withdrawing the knife. This may succeed in replacing the iris, and then section is continued. If not, the knife is withdrawn, and probe-pointed scissors are substituted, with which the wound is finished.[1]

[Mr. Tyrrell has suggested an improvement upon Beer's knife, which consists in shortening the blade, while the same depth is retained at the shoulder. Beer's knife (Fig. 48) measures $1\frac{3}{8}$ inch along the cutting edge; Mr. Tyrrell's (Fig. 49), only 1 inch. The advantage of the latter instrument is, that by it "the section of the cornea can generally be completed by a single thrust, before the point of the knife reaches the nose; whereas, in using Beer's knife, when the point has been carried as far as the nose will permit, a considerable portion of the cornea still remains to be divided, beneath the edge of the instrument, and it is difficult to complete the division of the part."—(*Tyrrell*, vol. ii. p. 392.)

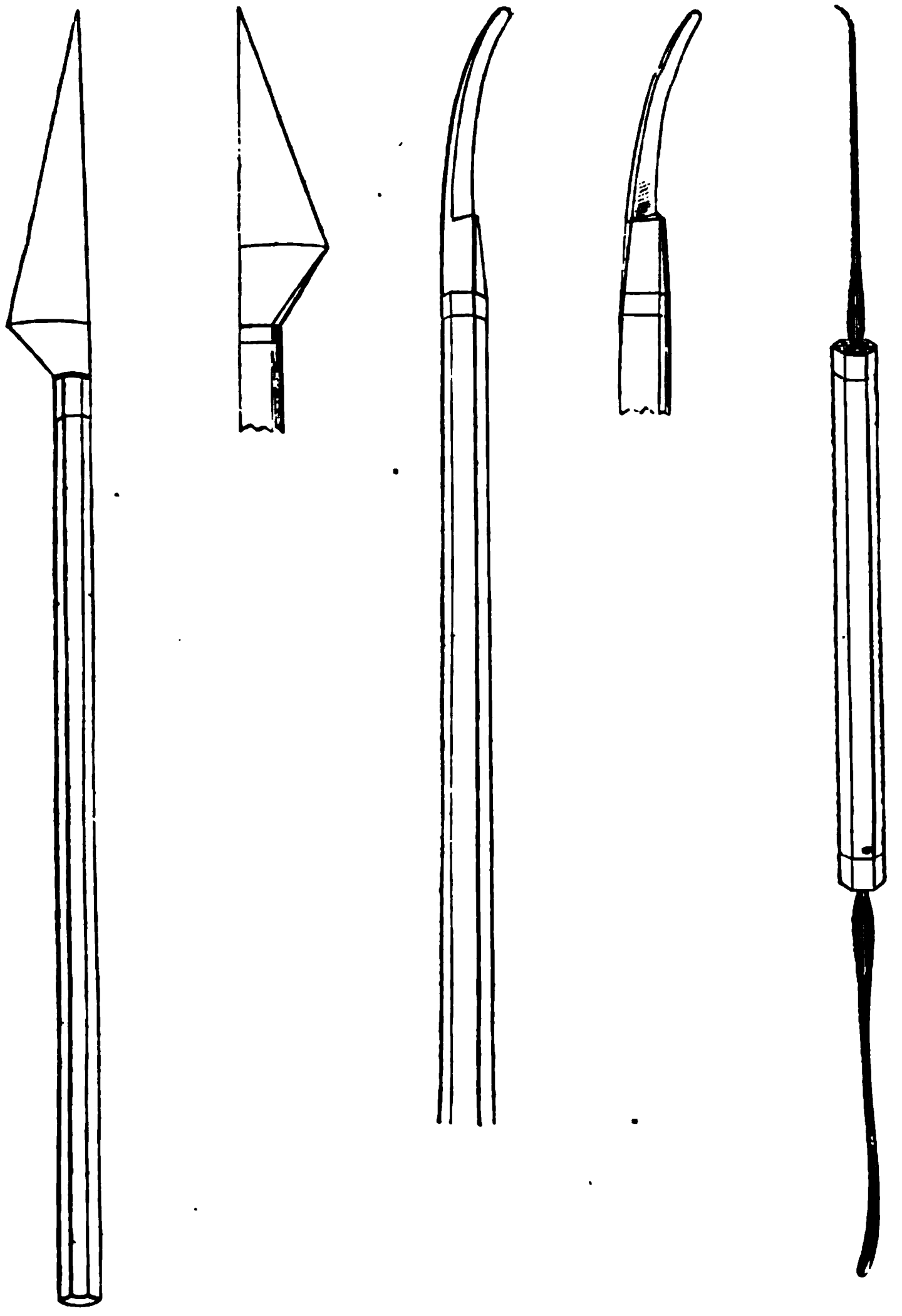
The incision in the cornea may sometimes be more readily enlarged by using one of the small curved knives, of which the accompanying drawings (Figs. 50–51) are illustrations; in one the cutting edge is upon the concavity, in the other on the convexity.—Ed.]

The corneal section having been completed, the eyelids are permitted to close, the eye to rest, and the pupil to dilate. Then, the lids having been gently reopened, the sharp end of a curette (Fig. 52), is cautiously introduced beneath the flap, and as gently as possible made to divide the capsule. The slightest possible pressure is then made on the upper eyelid—over the anterior part of the globe, just behind the corneal margin—so as to dislodge the lens—and nothing more. On escape of the opaque body, the corneal flap is properly adjusted, and the eyelids are permitted finally to close. Should the iris have prolapsed, sudden exposure to a bright light will probably suffice for its reduction, by causing contraction of the tissue; if not, the protruded portion may be replaced by gentle use of the blunt extremity of the curette. The eye is covered with a light pledget of lint, and a bandage. The patient should be laid on his back, with the head elevated; light and all other stimuli are to be rigidly excluded; the most sparing regimen is to be enjoined, the act of mastication even being interdicted; precautions are to be taken against coughing, vomiting, and sneezing; and, if need be, involuntary rubbing of the eye is to be provided against also. If possi-

[1] Or, according to the method of Sichel, and others, the operation may be interrupted and postponed till the humor is reproduced.

ble, the eye should not be uncovered, and exposed to the stimulus of light, for at least three or four days. The symptoms of inflammatory

Fig. 48. Fig. 49. Fig. 50. Fig. 51. Fig. 52.



[Fig. 48—Beer's Knife. Fig. 49.—Mr. Tyrrell's Knife. (From Lawrence.)—Ed.]

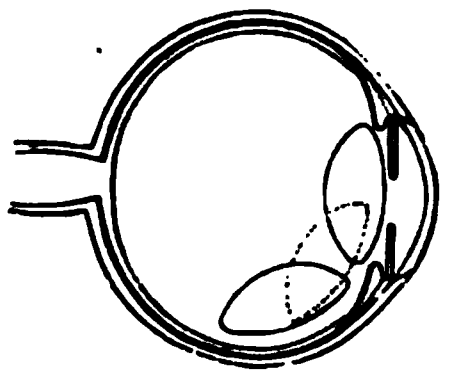
[Figs. 50 and 51.—Curved Knives for extending the incision in the cornea. (From Lawrence.)—Ed.]

[Fig. 52.—The Curette, a narrow, sharp-pointed, and slightly curved steel instrument; at the other end of the handle, Daviell's Scoop, or Spoon, a small silver instrument, sometimes used to remove the lens, if it do not readily engage in the opening. (From Lawrence.)—Ed.]

action must be carefully watched, and treated when they occur; by bleeding, purging, and abstinence—but obviously not by nauseants. Mercury, too, is inexpedient, lest it prevent such exudation as is necessary

for the healing of the cornea. The period of inflammatory action having passed, the eye is gently and gradually accustomed to its wonted stimulus; but exercise of its full function is to be very slowly resumed.

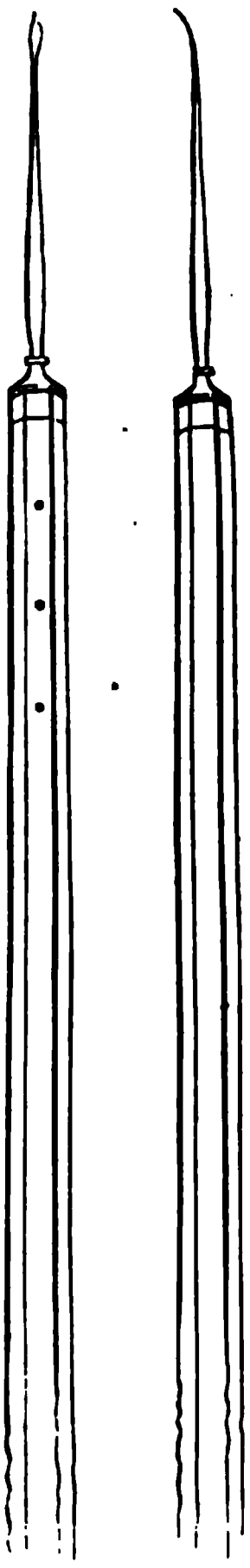
Fig. 53.



Depression. (From Wharton Jones.)

Depression, or *Couching*, implies downward displacement of a solid cataract, which it is not found expedient to extract. The pupil having been dilated by belladonna, the position of the patient is arranged as for extraction. The needle used for this purpose is the one known as Scarpa's, and which is curved at its point. It is pushed through the sclerotic, on the external side of the cornea, in the transverse axis of the eye, at the distance of a line from the corneal margin; this point being selected in order to avoid the two divisions of the long ciliary artery, which vessel usually bifurcates at a distance of two or three lines from the corneal margin; also to avoid wounding the retina and the ciliary body. The needle having entered, is pushed steadily forwards into the anterior chamber, between the iris and the lens. By depressing the hand a very little, its point is brought into contact with the upper part of the lens, the concavity of the instrument being opposed to that body. By now elevating the hand, the lens is depressed towards the bottom of the eye, gently and steadily, and the instrument, having been allowed to rest there for a few moments—detaining the displaced body, till the vitreous humor closes over it—is gently extricated and withdrawn. The eye is now closed, a piece of wetted lint, with a light bandage is applied, and the ordinary precautions against inflammation are to be adopted, as after extraction.

Fig. 54.



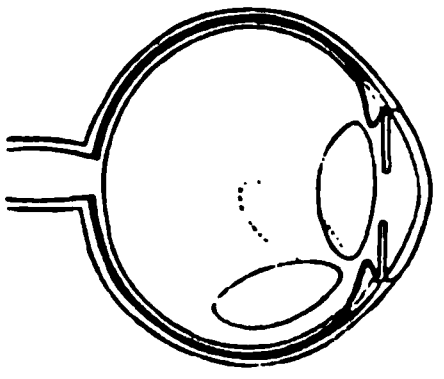
1 2

Scarpa's Needle. 1. Front view. 2. Side view.

Comparative facility of performance is in favor of depression. But the manifest objections are: danger of chronic inflammatory action, in consequence of the displaced body pressing upon or irritating the retina and ciliary processes; disorganization of the vitreous humor; and the possibility of future escape of the lens upwards—again to obstruct the transmission of light.

Reclination is a modification of depression. The instrument used, and the manner of introducing it, are the same as in the operation for depression; but the lens, instead of being completely dislocated and pushed downwards, is simply made to revolve partially, so as to turn its superior margin backwards into the vitreous humor; while its anterior

Fig. 55.



Reclination. (From Wharton Jones.)

surface is directed upwards, and remains nearly on a level with the lower edge of the pupil. Less injury is done to the retina than in depression; but reobstruction of the pupil is at least equally probable.

The operation to promote absorption, or *dissolution*, is practised when the lens is of fluid or semifluid consistence. The procedure is simple, and easily performed, but requires repetition; and the result is tardy, and may be uncertain. The object is, to admit the aqueous humor to a free and general contact with the substance of the lens—a circumstance which experience has shown to be conducive to absorption or solution of the latter. When *breaking up* is intended, the needle is introduced as for depression. Its point, having reached the pupil, in front of the lens, is made to divide the capsule by a slight rotating motion, and also to break up the lens into fragments. If the lens be fluid, no division of its substance is necessary; it escapes at once into the aqueous humor, on its capsule being opened. When of soft consistence, a few of the fragments often find their own way into the anterior chamber; if not, they are gently placed there by the needle; for, in that locality, absorption or solution seems to advance more rapidly than behind the iris. Care must be taken, however, not to dislodge the lens forward in a mass, or in bulky fragments; otherwise untoward inflammatory action may be induced, in the iris and other parts, by pressure of the lens upon them.

At the first operation, the lens is divided but slightly. Many deem it sufficient to divide the capsule only; and certainly it is well not to attempt any displacement; when the operation, however, requires to be repeated, the lens may be more freely broken up. A few weeks are allowed to intervene between the operations; and, after each, ordinary antiphlogistic precautions are to be adopted.

The operation by *drilling* is performed through the cornea. A straight needle is entered near the corneal margin, and passed through the pupil into the substance of the lens. Having penetrated into this, to the extent of about a sixteenth of an inch, it is rotated freely, and carefully withdrawn. The proceeding is repeated from time to time, as in the breaking up; on each occasion a fresh part of the lens being chosen as the site of puncture. The object is to admit the aqueous humor; and, by its agency on the lens, gradual absorption of that body takes place.

After removal of the lens, in any way, a convex glass requires to be adjusted to the eye, in order fully to restore vision. This is the duty of the optician. Only let it be the surgeon's care not to permit any such adjustment, and resumption of the full exercise of the organ, until at least two months have elapsed after the operation; and more especially if that operation have been by extraction; for not until then will the eye be safe from accession of inflammatory action.

If, after removal of the lens by operation, the capsule become opaque, and, occupying the pupil, obstruct vision, it may be got rid of in one of three ways. It may be extracted, through a minute aperture in the cornea, by a hook, or by small forceps. It may be detached at its

ciliary margin, by a needle, and depressed, like a lens. Or it may be crucially divided by the needle; and the flaps, shrinking from the centre, may leave the pupil patent and sufficiently free to admit light.

Dislocation of the Lens.

[*Dislocation of the lens* may take place, either spontaneously or in consequence of violence inflicted upon the eye.

The injury may have been inflicted by a thorn, or other sharp body, which has penetrated through the external tunics, wounded the capsule of the lens more or less extensively, and caused the lens itself to fall through the latter rupture. Violent inflammation speedily ensues, which may involve all the textures of the eye, and even cause the complete disorganization of the organ. The dislocated lens may fall into the posterior chamber, pressing the iris forwards, and obliterating, to a greater or less extent, the anterior chamber; or it may engage in the pupil, projecting into both chambers; or, it may pass through the pupil into the anterior chamber, and remain impacted between the iris and cornea; or, after having occupied one of these situations, it may undergo a gradual diminution in size, so as to pass from one to the other on changing the position of the head, constituting a *floating cataract.* Generally, after the inflammation which immediately succeeds the injury has been overcome, the lens becomes opaque, undergoes a gradual absorption, and may, at length, be entirely removed; the opaque and thickened *capsule* remaining permanently undissolved.

Similar changes—rupture of the capsule and dislocation of the lens—may follow a simple blow upon the eye, without any external wound. And Mr. Mackenzie suggests that, in many cases where loss of vision has followed a blow or other injury upon the orbit, involving the supra-orbital nerve, and has been attributed to the latter alone, the violence really implicated the ball of the eye also, occasioning dislocation of the lens, and consequently the blindness. It may also happen occasionally that, after a blow has been inflicted upon the eye, the patient having even forgotten the circumstance, the lens, diminished in size, and loosened from its natural attachments, drops through the pupil into the anterior chamber (Mackenzie, *Treatise*, p. 340). Such cases have been sometimes considered as instances of *spontaneous* dislocation.

The lens, inclosed within its capsule, the latter being wounded or entire, may be detached from its connections by a blow, and fall into the aqueous humor. If the capsule has been opened, absorption of the lens may take place pretty rapidly; but the opaque capsule, remaining unabsorbed, floats like a sac in the aqueous fluid (*cataracta cystica*). It is possible, perhaps, that even when the capsule is entire, the lens may be absorbed, and the bag-like capsule be left (*Mackenzie*, p. 340); but Mr. Lawrence says that a patient occasionally visited the London Ophthalmic Infirmary, with the lens, surrounded by its capsule, in the anterior chamber, where it had been twenty-eight years; and Beer mentions a case in which the lens had been in the anterior chamber twenty-six years, without any reduction in its size (*op. cit.* p. 183); in such circumstances the lens may even retain its transparency.

The lens may be forced into the vitreous humor; or through the choroid and sclerotica, so as to present, as a solid tumor, beneath the conjunctiva, of which several examples have been seen by Mr. Mackenzie, Mr. Middlemore, and others.[1]

Spontaneous dislocation of the lens may also occur, usually from loosening of the suspensory ligament, as in the cases cited by Mr. Bowman, in the *Appendix* to his *Lectures*. This condition of the ligament generally exists only as one of a number of lesions, of which the eye is, in such instances, the subject; *e. g.* cataract, a fluid condition of the vitreous body, etc. But spontaneous displacement of the lens may take place without any apparent cause or complication of this kind (*Lawrence*, p. 488).

For the correct *diagnosis* of this injury, in all its phases, a careful examination of the eye in various positions, the pupil being dilated, if necessary, by means of belladonna, and the employment of the catoptrical test are essential, whether the case be seen soon after the accident, or not until after some time has elapsed.

The *treatment* must vary according to circumstances. In all cases it is necessary to subdue existing inflammation by the appropriate means, and thus prevent destructive changes from taking place; operative interference, too, is often necessary. If the dislocated lens be in either chamber, or engaged in the pupil, and if the evidences of inflammation do not disappear promptly and satisfactorily under proper general and local treatment, the lens should be looked upon as a foreign and offending body, and should be removed by extraction. If the inflammation be overcome, it will be proper to wait, observing the changes which may occur in the lens, and deferring any operation which may eventually seem expedient, until a favorable opportunity. It must also be borne in mind that the uninjured eye is liable to suffer from the deranged condition of the other, if an operation be too long delayed.

If the lens be forced beneath the conjunctiva, it is easily extracted by making a simple incision over it; in the cases seen by Mr. Mackenzie, the aperture in the choroid and sclerotic had closed before division of the conjunctiva was made.

It happens, sometimes, that *traumatic cataract*, without dislocation of the lens, follows a blow, or a punctured wound of the cornea and capsule, or a blow without any solution of continuity. The wounding body may be very minute, as a needle, or a grain of wheat (case by Dr. Hays, *Lawrence*, p. 184). Opacity of the lens and capsule speedily ensues, accompanied by severe inflammation, and followed, of course, by loss of vision. After a time, absorption of the lens takes place, and may be wholly accomplished when the surgeon is consulted. In such cases, the pupil should be dilated, if possible, and a catoptrical examination be instituted, when the nature of the case will generally be detected (see cases by Dr. Hays, *op. cit.*). The treatment is to be governed by the same indications as if dislocation of the lens had taken place; if the inflammation is not readily subdued, the lens should be extracted, the patient being thus afforded a better prospect of recovery of sight than

[1] Mackenzie, Lond. Med. Gaz. vol. ix.; Lawrence, *op. cit.* p. 182.

if the lens be allowed to remain; if the inflammation has been happily overcome, and sight is lost, a suitable opportunity may be taken for a subsequent operation.[1]]

Affections of the Humors of the Eye.

Hydrophthalmia.

Dropsy of the eye may depend on excess of the aqueous humor, of the vitreous humor, or of both. In the first case there is tension, prominence, change of form, and increasing nebulosity of the cornea; the iris is changed in color, and impaired in mobility; the pupil is dilated; vision is much affected; there is a sense of fulness in the eye; and more or less headache is complained of.

When the vitreous humor is increased in quantity, enlargement and tension of the whole eye occur; the iris is motionless, and arched forwards; the sclerotica is attenuated, and has a bluish or brown appearance; vision is wholly lost; and the pain is deep seated and severe. Ultimately, the eyeball protrudes between the lids, inflames, and ulcerates; or rupture takes place, with partial evacuation of the humors.

Palliation is in our power, by evacuation of the redundant fluid—by puncture of the cornea or sclerotica, or by incision of the former texture. Sometimes the progress of the disease may be delayed, if not arrested, by counter-irritation and constitutional treatment.

Synchysis Oculi.

The term *Synchysis* denotes a deficiency, and unnatural fluidity, of the vitreous humor. The eye is shrunk and flaccid; the iris is tremulous; the pupil is motionless, and vision is either impaired or lost. Not unfrequently the lens becomes opaque. The disease is usually regarded as incurable.

Glaucoma.

By *Glaucoma* is understood an amaurotic state of the eye; with a greenish opacity, behind the pupil, concave, and deeply seated. According to some, this state is mainly attributable to affection of the retina; according to others, the choroid coat is chiefly implicated; while a third class are of opinion that change in the lens and vitreous humor is the principal cause of the disorder. It is probable that all these textures are more or less involved. The prominent and characteristic symptoms are, impairment or loss of sight, permanent dilatation of the pupil, green discoloration of the vitreous humor, and in the advanced stage of the disease opacity of the lens. Diagnosis from cataract is made easy, by observing that the opacity is more deeply seated than the lens; and that it becomes indistinct or even invisible when viewed laterally. The catoptrical test shows the three images of the

[1] [See Lawrence; Mackenzie, in Lond. Med. Gaz. vol. ix.; Barton, ditto, vol. v., etc.—Ed.]

candle at first; by and by, the middle inverted one is extinguished; but the deep-seated erect image generally remains throughout.

At the commencement of the disease, amendment may sometimes be obtained by local depletion, counter-irritation, alteratives, and a mild mercurial course, or exhibition of the iodide of potassium. If gouty or rheumatic symptoms exist—as is not unfrequently the case—the ordinary appropriate treatment is directed against that particular state of system. The advanced form is incurable. The disease seldom occurs, except in those of mature age.

Ophthalmitis.

This term, in its correct acceptation, denotes involvement of the entire globe of the eye in inflammatory action—an affection of much danger to structure and function, as can be readily understood; and one which demands the most careful and active treatment. The ordinary results of this inflammatory process are opacity, ulceration, or staphyloma of the cornea; adhesions of the iris, with contraction of the pupil; cataract; and often complete destruction of the organ of vision.

A very severe form of this disease occurs in puerperal women—sometimes in connection with the malignant childbed fever—sometimes independently of this. The symptoms are generally of the highest intensity, vision is rapidly impaired, and often there is great chemosis. Cases occasionally occur where the inflammation goes on to suppuration; the eye becoming a phlegmon. In such circumstances, great relief is experienced by opening the abscess.

Wounds of the Eyeball.

These are very common causes of acute ophthalmitis. And, accordingly, their treatment must be carefully conducted in order to avert disastrous results. If foreign matter lodge in the interior of the eye, antiphlogistics will avail but little, so long as the foreign body remains; the globe will suppurate, burst, and collapse. It is an important indication, therefore, to ascertain the presence and site of a foreign body, and to effect its removal. But the same difficulty is encountered as in the case of the brain (p. 70). It is difficult to ascertain either the site or presence of the foreign matter; and, even when these are plain, it is often very difficult to effect its removal without most serious injury to the organ. In regard to prognosis, it is important to bear in mind, that there may be foreign matter in the interior of the eye, without any apparent solution of continuity in either the cornea or sclerotic. For the elasticity of texture may at once close the chasm in the tunic, and conceal it from even minute inspection.

Entozoa.

The *Filaria medinensis* has been found beneath the conjunctiva; the *Filaria oculi humani* in the lens. In the latter texture, also, have

been found the *Monostoma lentis*, and the *Distoma oculi*. The *Cysticercus telæ cellulosæ* has more than once occupied the anterior chamber; it may be removed by section of the cornea.

Tumors.

The eyeball is liable to be the seat of two kinds of tumor; both malignant—the medullary, and the melanotic. Carcinoma is rare. The medullary tumor is most common at an early age, and seems usually to originate in connection with the retina; growing from the bottom of the eye, occupying the chamber of the vitreous humor, and rapidly making its way externally. Loss of vision is early and complete; the tumor in its first stage can be seen dimly, through the pupil; and the pain, cachexy, and other signs of the medullary tumor are present to testify its character (*Principles*, 3d Am. Ed. p. 322). When the coats of the eye have given way, the tumor increases more rapidly than before; a fungus is thrown out; and this may assume the hemorrhagic tendency. The end is death. Cure can be attempted in but one way—by extirpation of the eyeball; and that only at an early period, when the disease is confined to the interior of the globe; and even after removal of the globe, the disease frequently returns again in the optic nerve; eventually destroying life. In the advanced stage, all operative interference is contraindicated; reproduction is certain; and the progress of the disease, instead of being arrested or retarded, is likely to become accelerated. Indeed, the cases are very few in which the operation has proved thoroughly successful. Lately, however, I had occasion, on account of false aneurism at the bend of the arm, to tie the humeral artery of a gentleman aged thirty-three, who, at the age of nine, had undergone extirpation of the eyeball on account of medullary tumor;[1] and in him there has never been the slightest symptom of return.

The melanotic tumor generally occurs after the middle period of life; it slowly fills up the interior of the eye; is seen dim, black, and bulging, through the pupil; ultimately thinning the coats, and forming dark colored external projections of the sclerotic; attended with pain, tension, and early loss of vision. In some cases, care is required not to mistake the disease for simple staphyloma of the sclerotic (p. 131). The only cure is extirpation of the eyeball, and this should be done at as early a period as possible.

Extirpation of the Eyeball.

This operation may be required on account of tumor of the eyeball; tumor of the orbit, involving the globe secondarily; cancerous ulceration of the eyelids, involving the globe, or destroying the whole of the eyelids—as formerly explained (p. 95). The commissure of the eyelids having been divided, at the outer angle, so as to afford space, the globe is laid hold of by a volsella; and by this instrument is steadied and directed, throughout the remainder of the procedure. A straight bis-

[1] Edinburgh Medical and Surgical Journal, vol. xix. p. 51.

toury is entered at the margin of the orbit, and made to move round, so as to detach the muscles and other parts from the bone; the point, however, being used very carefully at the bottom of the orbit lest perforation of the thin orbital plate should occur. The optic nerve is then cut across, and the tumor withdrawn. If there be reason to suspect unusual attenuation of the bone—perhaps partial deficiency—it were no unwise precaution to effect the deeper dissection by the handle of the scalpel. If the lachrymal gland have escaped the general removal, it may be seized by a hook, and dissected away; but this is not absolutely necessary. Having become satisfied of the entire removal of the diseased structure, the cavity is sponged clear of blood; dossils of dry lint or charpie are placed so as to fill the orbit and project somewhat beyond the margin, and a retaining bandage is passed around, with sufficient firmness to arrest bleeding from the ophthalmic vessels. After a few days, the dressing is gradually undone and removed; suppuration is established; granulation succeeds; and the granulating wound is to be treated in the ordinary way. After cicatrization, an artificial eye may be adapted to the socket.

Congenital Deficiency of the Eyeball.

An interesting example of this occurred to me some years ago. A girl, strumous, and of strumous parentage, labored under conjunctivitis, which proved very obstinate, and had already produced considerable opacity of both corneæ. The mother, naturally of an anxious temperament, had her every thought engrossed by the state of this child—then an only one. She again became pregnant; and still persevered in her watchful nursing unweariedly, and, if possible, with an increased solicitude. The second child was born at the full time. It proved a male, well-formed, and seemingly perfect in every way. But, on opening the eyelids, not a vestige of either eyeball could be found. The lids were perfectly normal in both form and size, but gave no sign of globular projection beneath; and on opening them, red, fleshy, mucous-looking membrane, flat and loose, was found to be the apparently sole occupant of the orbits. As the child grew, the congenital deficiency remained unaltered.

Strabismus.

Squinting may affect one eye, or both. Very frequently both are implicated; but one only in a minor degree. The immediate cause obviously depends on inharmonious action of the recti muscles. One may act excessively, while its antagonist retains quite its normal character; and displacement is effected by the former. Or—as there is good reason to believe frequently happens—one retains its normal condition, while the other is enfeebled, or altogether paralyzed; and displacement is caused by the former. The ordinary varieties of squinting are the *Convergent*, looking inwards; the *Divergent*, looking outwards. The former is by much the more frequent.

A great advance has been made in the treatment of this deformity,

by having recourse to division of the muscle on the side towards which there is displacement—an operation suggested by Stromeyer, and first performed by the late Dr. Dieffenbach of Berlin. The patient is placed as for other ophthalmic operations. The eye which is not the subject of treatment is closed; and the patient is made to turn the affected organ in the direction opposite to that of the squint. A fold of conjunctiva, between the cornea and the angle of the eye, but nearer to the latter than to the former, is then seized and elevated, by means of common dissecting forceps; and is divided by a stroke of the scissors. By one or two touches of the scissors, aided by the forceps, the subconjunctival areolar tissue is cut, and the muscle exposed—at that point where it ceases to be fleshy and begins to be tendinous. It may either be gathered up by the forceps, or elevated on a blunt-hook passed beneath. It is then divided completely. And it is well to make, at the same time, a clean dissection of the sclerotic, for some little distance on either aspect of the muscle; so as to divide any bands of fibrous or areolar tissue, which might otherwise act retentively on the malposition of the eye. If the organ prove unsteady during the operation, it may be expedient to control its motions by means of a sharp, short, double hook, inserted into the sclerotic conjunctiva at a safe distance from the corneal margin. The operation over, and all instruments withdrawn, the patient is directed to look as he formerly squinted. If he finds a difficulty in re-effecting the displacement, the immediate result of the operation may be considered as fully attained. But otherwise, it is necessary to make a more free division of the textures implicated; in all cases, however, taking care not to occasion an unseemly exophthalmos, by carrying such division to an undue extent. The eye is covered up for a day or two; and moderate antiphlogistics are used. Untoward inflammatory action seldom occurs. The wound may unite by adhesion. More frequently, it heals by the second intention. Sometimes a fungous granulation forms; this is removed by the scissors, and is subsequently kept down by gentle escharotics. After a few days, the functions of the eye are to be resumed, and they should be so arranged as to give the organ an habitual movement in the direction opposite to that whereto it was formerly directed. Indeed, this exercise or training of the eye, subsequently to the operation, is a very essential part of the treatment; and should be begun at an early period after the operation—almost immediately; otherwise an improper reunion of the divided muscle may take place, and maladjustment of the eyeball be restored.

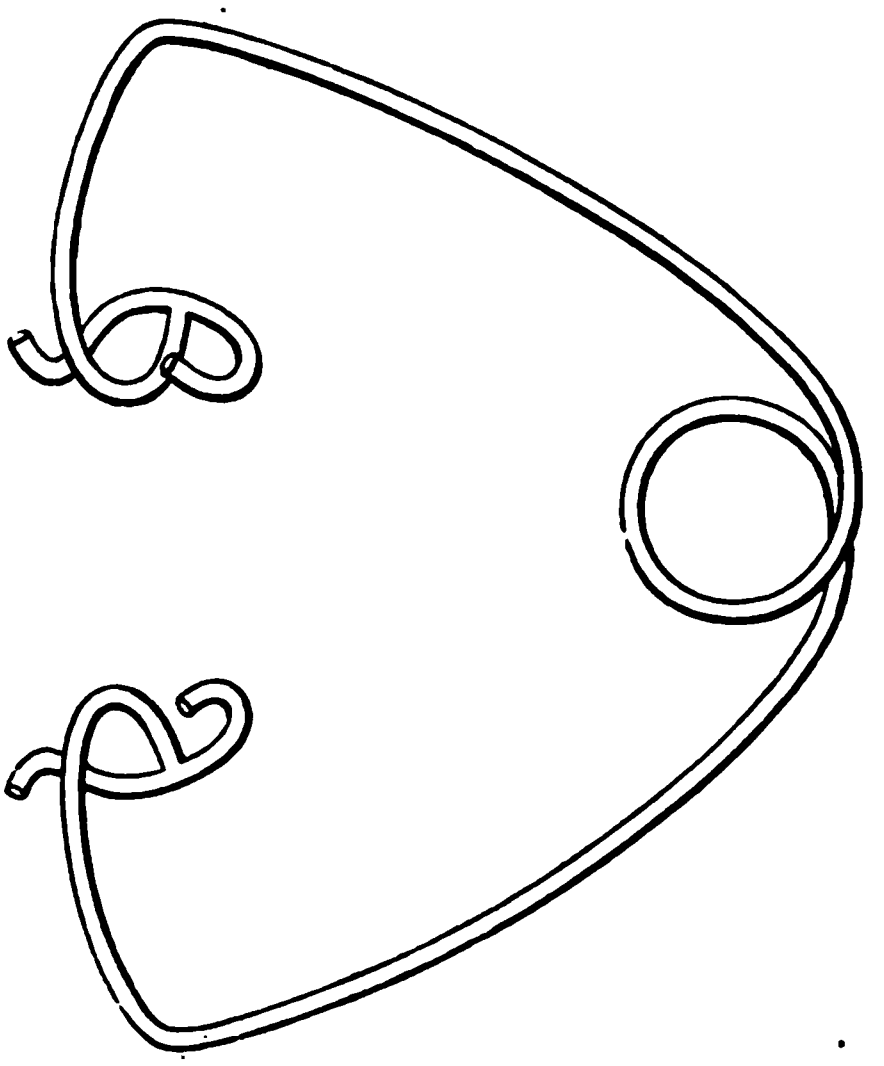
Fig. 56.

Plan of the Eye, showing the line of incision in the conjunctiva.

Occasionally the cure is more than complete; squinting in the opposite direction being threatened. And were the other rectus muscle now to be divided, unseemly projection of the eyeball could not fail to be produced. Fortunately, it is often sufficient to excise merely a portion of the conjunctiva near the cicatrix of the wound; the contraction of this new sore, in healing, tending to restore the normal position.

[The instruments illustrated by the accompanying drawings, are those recommended for this operation by Dr. Hays, of this city, in his edition of Mr. Lawrence's *Treatise on the Eye;* they will be found very serviceable.—Ed.]

Fig. 57.



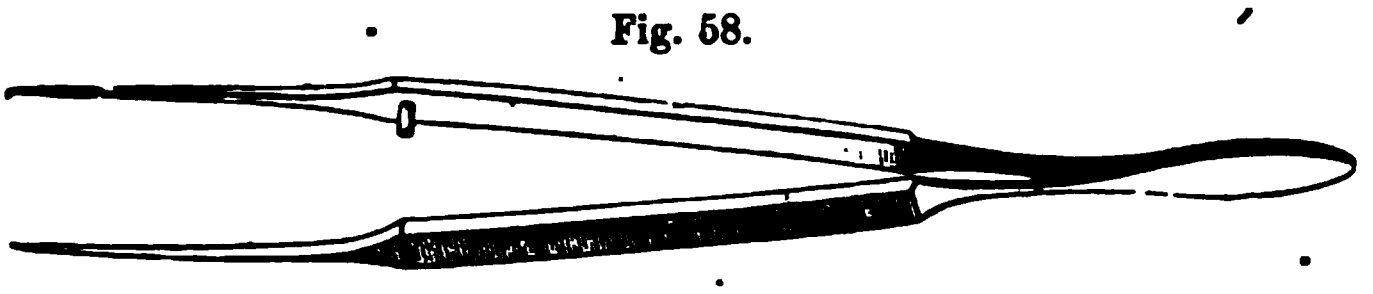
[An elastic steel-wire Speculum for separating the Eyelids.—Ed.]

Sometimes it is sufficient to operate on one eye only. At other times we are compelled to operate on both. For, when both eyes are implicated in squinting—though in very unequal degrees—it will be found quite impossible to restore parallelism in position and motion, if the myotomy be limited to that organ which is most prominently affected—let the division be as extensive as it may.

When operation proves in all respects successful, not only is deformity removed, the function of sight is also materially benefited. But all squints do not require myotomy. According to the cause and circumstance, the treatment varies.

Strabismus may be congenital. During early adolescence, attempts are to be made to remedy the evil by due exercise or training of the organ, when one only is affected. The sound eye is to be covered up for some hours in the day; and the other, employed exclusively, may in time be compelled, as it were, to look straight upon the objects of sight. But care must at the same time be taken, that the sound eye do not

Fig. 58.



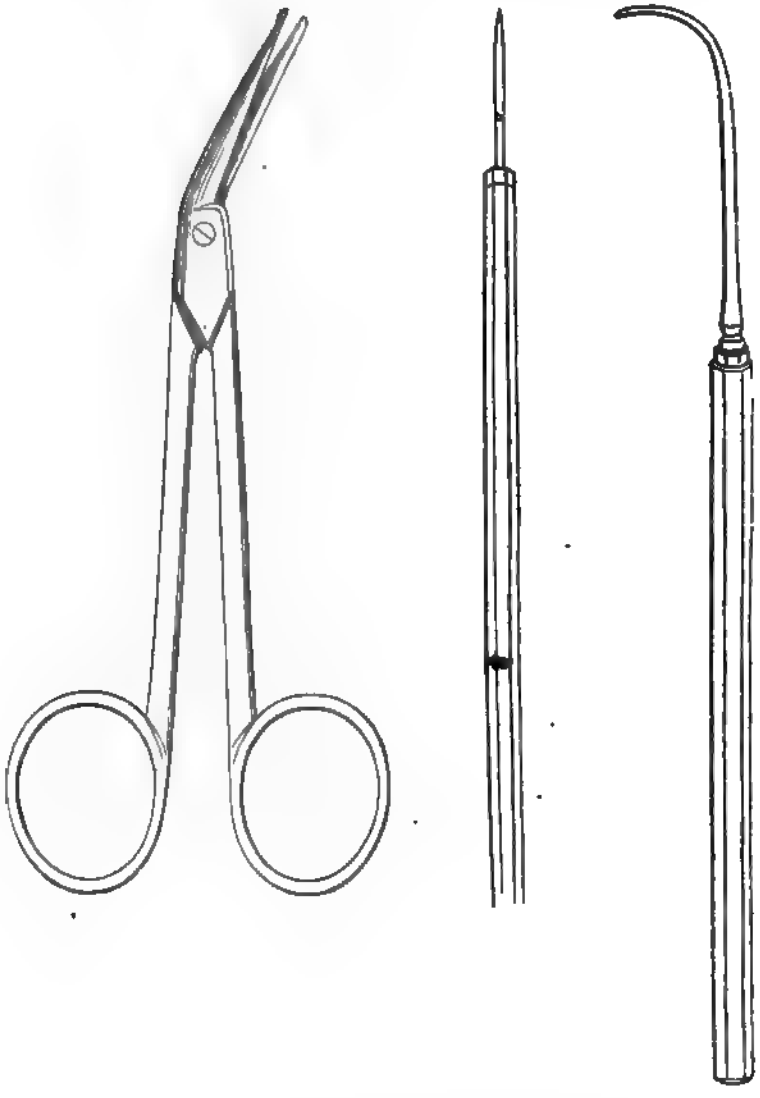
[A pair of small Toothed-Forceps, for pinching up a fold of the Conjunctiva.—Ed.]

suffer from undue confinement and disuse. Or a pair of spectacles, or goggles, may be worn occasionally, through which the patient cannot see with both eyes, unless they are directed in a parallel manner. When such means fail, myotomy may be had recourse to.

Squinting not unfrequently is the result of imitation. This must be corrected by breaking off the habit, and removing the patient from circumstances likely to induce its repetition; also by the remedial exercise of the organ just noticed. The like treatment is available, when squinting has been induced by the presence of marks on the nose or cheek, to which the eyes are from time to time directed; when it has followed

on a long confinement of the patient to one posture, perhaps constrained; when it is the result of using one eye habitually and painfully directed on small objects, as in certain mechanical professions.

Fig. 59. Fig. 60. Fig. 61.



[Fig. 59. A pair of small Scissors, one blade probe-pointed, for dividing the Conjunctiva.
Fig. 60. A small Iris-Knife, which may be used instead of the Scissors, if preferred.
Fig. 61. A blunt silver Hook to be passed under the muscle previous to dividing it.—Ed.]

In children, squinting is not unfrequently connected with gastric and intestinal irritation; and is remediable by purgatives, alteratives, or

anthelmintics. In such cases the strabismus is almost invariably convergent; as can be readily understood, when it is remembered how closely the sixth pair of nerves is connected with the sympathetic. Sometimes squinting is but a sign of general disorder in the system; and disappears, along with the other symptoms, under appropriate constitutional treatment. At any age, it may be the concomitant of important cerebral disorder.

Not unfrequently, squinting occurs as a sequela of some infantile disease. In such cases, the affection is of an atonic character; and may be mitigated, perhaps removed, by a general tonic system of treatment, by the application of strychnia to the temple and forehead, or by the passing of electro-magnetism through the part.

As a general rule, the operation should not be performed, until other means likely to prove remedial, have been found insufficient. And in the case of the female near the age of puberty, the operation should always be withheld, until the catamenia have appeared; inasmuch as, on this occurrence, rapid amendment and removal of the deformity is, by no means, unlikely to occur.

ENGLISH.—*J. C. Saunders*, Treatise on some Practical Points relating to the Diseases of the Eye, 2d ed. London, 1816.—*J. Wardrop*, The Morbid Anatomy of the Human Eye, vol. i. Edinburgh, 1808; vol. ii. London, 1818.—*B. Travers*, A Synopsis of the Diseases of the Eye and their Treatment, 3d ed. London, 1823.—*G. J. Guthrie*, Lectures on the Operative Surgery of the Eye, London, 1823.—*A. Watson*, A Compendium of the Diseases of the Human Eye, 2d ed. Edinburgh, 1828.—*R. Middlemore*, A Treatise on the Diseases of the Eye, 2 vols. London, 1835.—*F. Tyrrell*, A Practical Work on the Diseases of the Eye, &c. 2 vols. London, 1840.—*W. Mackenzie*, A Practical Treatise on the Diseases of the Eye, 3d ed. London, 1840.—*W. Lawrence*, A Treatise on the Diseases of the Eye, 2d ed. London, 1841.—*S. Littell*, A Manual of the Diseases of the Eye, 2d ed. Philadelphia, 1846.—*T. Wharton Jones*, A Manual of Ophthalmic Medicine and Surgery, London, 1847.—*A. Jacob*, A Treatise on Inflammations of the Eyeball, &c. Dublin, 1849.—*J. Dalrymple*, Pathology of the Human Eye, London, 1852.

FRENCH.—*A. P. Demours*, Traité des Maladies des Yeux, 4 vols. Paris, 1818.—*J. Sichel*, Traité de l'ophthalmie, &c. Paris, 1837.—*Carron du Villards*, Guide Pratique pour l'Etude et le Traitement des Maladies des Yeux, 2 vols. Paris, 1838.—*Velpeau*, Manuel Pratique des Maladies des Yeux, &c. Paris, 1840.—*M. F. Rognetta*, Traité Philosophique et Clinique d'ophthalmologie, &c. Paris, 1844.—*Deval*, Chirurgie Oculaire, Paris, 1844.—*Desmarres*, Traité des Maladies des Yeux, Paris, 1847.—[*Sichel*, Iconographie Ophthalmologique, Paris, now being published in numbers.—ED.]

GERMAN.—*Beer*, Lehre von den Augenkrankheiten, 2 vols. Vienna, 1813–1817.—*C. H. Weller*, Die Krankheiten des Menschlichen Auges, 4th ed. Berlin, 1830.—*F. A. Von Ammon*, Zeitschrift für ophthalmologie, Dresden and Heidelberg, 1830–1837.—*A. Rosas*, Lehre von den Augenkrankheiten, Vienna, 1834.—*J. C. Juengken*, Die Lehre von den Augenkrankheiten, 3d ed. Berlin, 1842.

ITALIAN.—*A. Scarpa*, Saggio di Osservazioni sulle Principali Malattie degli Occhi, Pavia, 1801; or Translation by Briggs, 1818.—*G. Quadri*, Annotazioni Pratiche sulle Malattie degli Occhi, 4 vols. Naples, 1818–1830.

CHAPTER VI.

AFFECTIONS OF THE NOSE.

Fracture of the Nasal Bones.

FRACTURE of the nasal bones is the result of external violence, directly applied. It may be either simple or comminuted; and the latter form is of frequent occurrence. It may be either simple or compound; and the latter form may be constituted by wound of the integument, or by laceration of the internal mucous membrane, or by a combination of both circumstances. Deformity, by displacement, is a very prominent feature of the injury; the slightest manipulation suffices to detect decrepitation; and this sensation is often greatly extended, by an emphysematous condition of the areolar tissue, in those cases in which the mucous membrane has sustained greater injury than the skin. Swelling and discoloration occur, to a greater or less extent; and usually pass laterally and downwards, to the eyelids and cheek.

Replacement is easily effected, by passing a pair of small dressing-forceps, or the ordinary polypus-forceps, shut—or a goose-quill, blow-pipe, director, or female catheter—into the upper part of the nostril; pressing outwards with the instrument, so as to restore the normal position of the fragments; and at the same time modelling them into their proper place by the fingers of the other hand applied externally. Sometimes, indeed, it may be in our power to improve on the original elevation, and to impart to the organ a more pleasing contour than it originally possessed. If any small fragments be completely detached and exposed, they should be at once removed. No retentive apparatus is necessary; for redisplacement is not likely to occur, unless under reapplication of external violence. But if bleeding prove troublesome from the membrane, it may be necessary to plug the nares gently with lint. If there be wound of the soft parts, it is treated according to ordinary principles. And, in all cases, the requisite precautions are put in force against the accession of overaction, and the risk of erysipelas.

Lipoma of the Nose.

By this term is understood a hypertrophied condition of the integument and subcutaneous adipose tissue of the apex and alæ; seldom occurring but in the male, of advanced years, who has lived freely. When the enlargement is partial and of no great bulk, no operative interference is required. It is sufficient to attend to regimen, and to the state of the general system, so as to prevent, if possible, farther growth; and

direct medical treatment may be applied to the organ itself, with a view towards restoring it to a normal state. But when the growth is large, it proves a serious inconvenience; interrupting vision, and interfering

Fig. 62.

Lipoma of the Nose.

unpleasantly with the spoon and the wineglass; and, in consequence, surgical aid may be asked and granted. The redundant growth is to be carefully pared away. A finger having been placed in the nostril, so as to distend the part, and facilitate dissection—while, at the same time, division of the cartilage is provided against—the scalpel and forceps are carefully used, so as to remove the whole of the changed integuments. The bleeding is considerable; but is quite amenable to arrest by cold, pressure, and ligature. Sometimes the parts are so dense as to preclude ordinary use of the ligature; in which case, if pressure fail, the curved needle is to be employed (*Principles*, 3d Am. Ed. p. 350). Cicatrization is tardy; but, when obtained, is satisfactory. Apparent reproduction may take place by growth from the surrounding integument, formerly unaffected; but the cicatrix itself usually remains firm and depressed.

Polypus of the Nose.

Nasal polypi are of various kinds; simple-mucous, and cysto-mucous; fibrous, and medullary (*Principles*, 3d Am. Ed. p. 390). The first are, fortunately, of most frequent occurrence; and usually are found adherent to the investing membrane of the superior turbinated bones.

The symptoms of the common mucous polypus are sufficiently characteristic. The patient feels that something unusual, and apparently fleshy, is occupying the nostril; calls to blow the nose are unusually

frequent, and can be but imperfectly obeyed—passage of air through that nostril being found to be much obstructed; there is a preternatural amount of mucous discharge from the part; on attempting to blow the nose, a great portion of the mucous secretion is thrown into the pharynx; there is a constant feeling as if there existed "a cold in the head;" very frequently, there is lachrymation, the extremity of the nasal duct being compressed by the growth, or the lining membrane of the duct being sympathizingly involved in congestion; and these uncomfortable circumstances are all aggravated in damp and variable weather. On looking into the nostril the tumor is seen; and, when the speculum is used, a very distinct exploration of its bulk and form may in most instances be effected. When the mass has attained to some considerable size, it renders itself apparent by projecting on the upper lip. As it enlarges backwards, deafness may be produced by pressure on the Eustachian tube; and giddiness may be occasioned by compression of the jugular. The sense of smell is necessarily much impaired; and so in many cases is that of taste. Speech is indistinct, and snuffling. In sleep, the patient is an habitual and sonorous snorer. After a time, the countenance may undergo a formidable change; the nasal bones becoming gradually disjoined and expanded; giving a very unpleasant breadth to this part, and establishing the condition which is ordinarily termed "Frog-face." (Fig. 64.) Then—and often, also, at an early period of the case—pain is complained of in the head, especially in the forehead.

Fig. 63.

Simple Mucous Polypi, seen growing in the nasal passages.

In the minor cases, it is essential that diagnosis be accurate. Symptoms are not trusted to alone. The speculum must be employed, so as to expose the nasal cavity; enabling us to ascertain whether the obstruction depends on nascent polypus or not. For the disease is apt to be simulated. There may be merely a general congestion of the lining membrane. Or there may be a bulging of the septum to one side, with or without congestion of the membrane on the convexity of the bulge. There may be abscess forming between the septum and its investing membrane. Or there may be a hypertrophied condition of the spongy bone. Any of these circumstances may produce more or less occlusion of the nostril, increase of discharge, snuffling of speech, and most of the ordinary symptoms of polypus. By use of the speculum only can the true condition of parts be determined.

If there be no polypus, no forceps are required. For congestion, abstraction of blood and astringent lotions are sufficient, with roborant treatment constitutionally. Abscess of the septum may be prevented by leeching; when formed, it requires evacuation. Displacement of the septum, and enlargement of bone, call for no interference.

Removal of the common polypus is effected by twisting and evulsion (*Principles*, 3d Am. Ed. p. 391). Care is taken to apply the forceps

Fig. 64.

Frog-face; the polypi causing much deformity by expansion of the bones, and change of relative position in the soft parts.

accurately to the neck of the tumor, so as to insure removal of the entire mass; and gentleness is used, so as not to endanger evulsion of bone. The forceps are well toothed, firmly jointed—and secured by a pin between the blades, so as to prevent them passing each other during the twisting movement; strong, yet not so bulky as those commonly in use — less than the "dressing-forceps" of the ordinary pocket-case. Sometimes, forceps considerably curved are useful in reaching small soft polypi, which not unfrequently grow from the upper and front part of the nares, and which the ordinary instrument passes by. The tumors being generally numerous, more than one operation is usually required to effect eradication of the whole; and of this the patient should be warned in the first instance, to prevent disappointment. After temporary clearance of the nostril has been effected, the cavity is plugged with lint; to arrest bleeding, and prevent the access of cold air to the raw surface.

A second operation is not attempted until the inflammatory results of the former have completely subsided; nor until examination by the speculum has revealed the fresh crop of tumors, somewhat advanced to mature development. This may be after weeks or months.

After the nostril has been finally cleared, the use of an astringent is

advisable—such as a solution of zinc, nitrate of silver, alum, matico—with a view to prevent reproduction, and restore the mucous membrane to a sound state. The following form is often found very suitable: sulphate of zinc half a drachm, tincture of Galls one drachm, water eight ounces.

If evulsion be found to cause inordinate pain, with inflammatory symptoms, the attachments of the polypi, in the repeated operation, may be severed by probe-pointed scissors or knife.

The dense fibrous polypus, when originating from the posterior part of the nasal cavity, projects backwards, is of a somewhat pyriform shape, and hangs pendulous in the fauces. For removal of such a tumor, the use of ligature is most suitable. A long double loop of wire, catgut, or strong cord, is passed through the affected nostril. The noose is caught, as it appears in the posterior fauces, by forceps introduced through the mouth. And then, by fingers or forceps, the loop may be carried over the fundus of the tumor; so that on drawing the ends hanging out of the nostril, the noose may be run tight upon the upper part of the growth. This having been done, the nasal ends are passed separately through a double silver canula, which is then pushed into the nostril until its extremity rests on the polypus. By pulling the ends, the noose is now completely tightened, so as to strangulate the mass at its attachment. And the ends, drawn tightly, are secured through rings placed for this purpose at the anterior extremity of the canula. From time to time, a renewal of the tightening may be had recourse to. The tumor at last drops away; and is either swallowed, or coughed up and discharged by the mouth.

Sometimes, however, the noosing of the mass cannot be so easily accomplished. The double ligature having been passed as before, the loop hanging out of the mouth is divided, so as to constitute two single ligatures. The oral end of one is passed through a long single canula, and is carried carefully under the base of the tumor on one side. In the same way the corresponding end of the other ligature is managed, so that this ligature passes round the tumor on the opposite side. The directing canula having been then withdrawn, the double form of ligature is restored by uniting the oral ends in a firm knot. The nasal ends are now drawn, and the noose is run tight on the tumor, at its upper part, as before, tightening of the noose being effected by means of the double canula passed through the nose.[1]

But a dense and firm polypus may occupy the anterior part of the nares, broad in its attachment, and firmly united with both periosteum and bone. Such tumors experience has declared to be prone to degeneration, early becoming vascular, softening, and ultimately assuming the medullary character. Removal therefore is highly expedient, and, to be effectual, it must be both early and complete. Ligature will not suffice. The morbid structure must be cut out, along with the parts from which it springs, and with which it is intimately incorporated. The operation is formidable and severe, but not the less expedient. No fixed rules can be given to guide the operative procedure. It may be

[1] Brodie, Lancet, No. 1058, p. 316.

possible to disclose the tumor and its site sufficiently by simple incision of the nostril. Or it may be necessary to remove a portion of the superior maxilla.[1]

The *medullary* and malignant nasal polypi may be regarded as incurable. By the time the case has been submitted to the surgeon, the morbid structure has so extended as to render its entire removal, by any feasible operation, impracticable, and we content ourselves with palliation. If much distress be occasioned by occlusion of the nostril, the soft obstructing mass may from time to time be pushed away by the finger or probe; but even this interference must be very carefully practised, lest troublesome hemorrhage ensue. Also, let us beware of mistaking protrusion and pointing of the tumor, at the internal canthus, for fistula lachrymalis about to form (p. 107).

The *erectile tumor* has been found growing from the anterior nares, not merely an inconvenience, but dangerous by tendency to hemorrhage. Cure has been obtained by destructive application of the actual cautery to the diseased tissue.[2]

Rhinolithes.

Rhinolithes, or calculi of the nasal fossæ, are composed of mucus, phosphate of lime, and the carbonates of lime and magnesia, and are most frequently found in the inferior meatus. In volume they vary from a pea to a pigeon's egg; in color, black, gray, or white; of rough surface, and often containing a foreign body, or the root of an incisor tooth, as a mulens. Sometimes they create but little disturbance; in other cases, chronic inflammatory action is lit up; in some, suppuration occurs, with profuse fetid discharge, and the septum may ultimately give way by ulceration, the whole organ becoming seriously deformed. The eye too may sympathize, and that seriously. Treatment is by extraction of the offending substance, and this is to be effected either by forceps or by scoop, as may seem most convenient, antiphlogistics being afterwards employed to subdue excitement.[3]

Epistaxis.

By this term is understood, an inordinate hemorrhage from one or both nostrils. It may be the immediate result of an operation for polypus; it may follow external injury, with or without fracture of the nasal bones; it may be one of the untoward results of medullary formation, within the nasal cavity, or connected with it; it may be a critical depletion, of natural occurrence, tending towards resolution of an inflammatory process, or it may be the consequence of a passively congested and hemorrhagic state of the Schneiderian membrane. The common bleedings of the nose in adolescents, caused by plethora, and tending to

[1] Syme, London and Edinburgh Monthly Journal, 1842, p. 791.

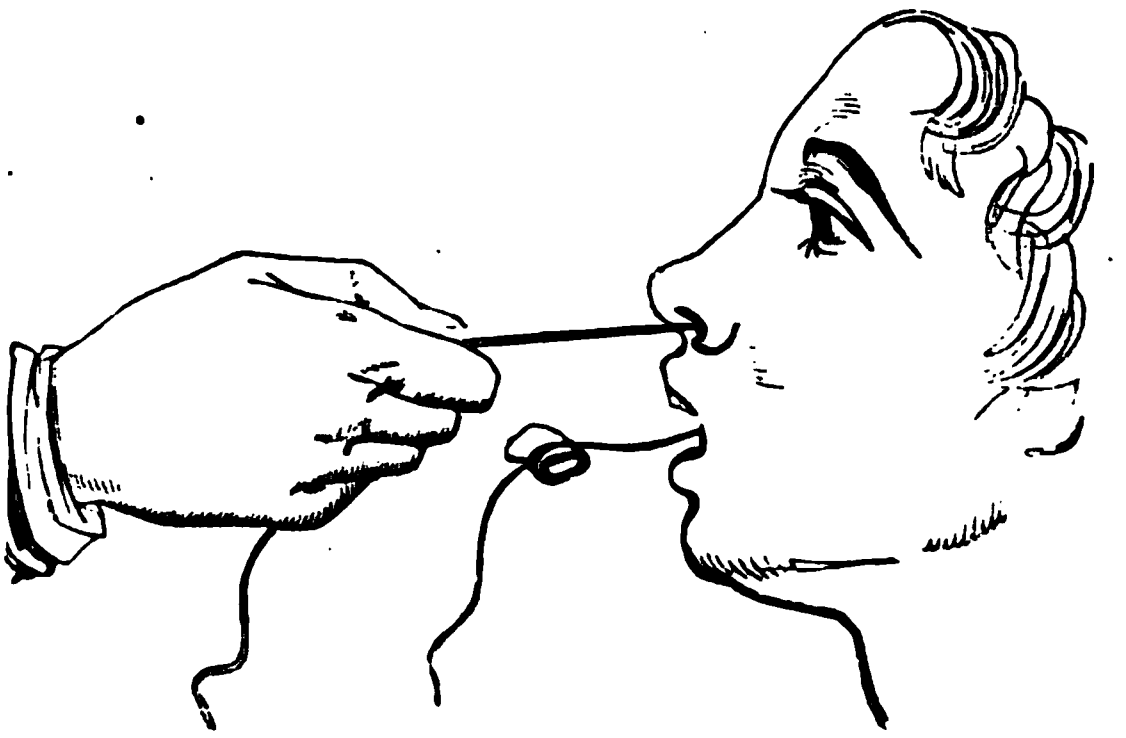
[2] Dublin Quarterly Journal, Feb. 1847, p. 81. [See a very good paper on nasal polypus, by Dr. Watson, of New York, in Am. Journal of Med. Sci. 1848.—Ed.]

[3] Demarquay, Annales de la Chirurgie, July, 1845, and Ranking's Retrospect, vol. ii. p. 106.

relieve the system from that unsafe condition, scarcely come under the designation of epistaxis; usually, the bleeding is not inordinate, is in all respects safe and beneficial, and certainly requires the adoption of no means for its arrest.

Our first duty, when called to a case of alarming hemorrhage from the nose, is nòt at once to attempt to check it, but to determine whether such an attempt be advisable or not. If the bleeding be habitual, in a robust and plethoric patient, not very far advanced in years—if it be at all critical in its history as connected with an inflammatory attack advancing in some adjacent part—if we are told that the patient has been subject to giddiness, or other affections of the head—we are certainly not to interfere, unless evident signs exist that a greater amount of blood has already flowed than the system can well bear, and that farther loss would probably be attended with hazardous consequences. Then, but not till then, we endeavor to prevent continuance. The patient's head is elevated, and cold is applied to the nose, forehead, and back of the neck. All stimuli are forbidden, and absolute rest and quietude enjoined. This treatment failing, astringents may be taken into the nostril, and applied to the bleeding surface, by injection or by insufflation, Ruspini's styptic, a solution of zinc or alum, turpentine dilute, powdered gall-nuts, matico, &c. And this method of arrest may be assisted by obstruction of the anterior nares, either by compression, or by stuffing the cavity firmly with lint, after the styptic has been sufficiently applied. Lately, it has been proposed to elevate the arm, or arms, and to retain them raised above the head, and certainly this proceeding would seem occasionally to contribute, at least, towards the successful result, perhaps in consequence of greater power being required to propel the arterial blood upwards in the arm, and less consequently being expended on the carotid circulation, as the originator,[1] Dr. Negrier, imagines, or perhaps in consequence of the increased facility of venous

Fig. 65.



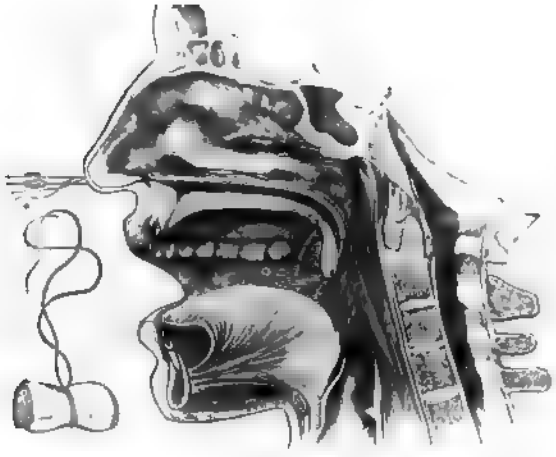
The arresting of Hemorrhage by plugging. A plug, about to be lodged firmly in the posterior nares, by means of the ligature. This having been done, and a plug afterwards placed in the front nares, the bleeding from *that* nostril is fairly commanded.

[1] Archives Générales de Médecine, June, 1842.

return in the subclavian vein "hurrying the return-blood in the jugulars, and thus deriving from the bleeding vessels of the nose."

When such minor means fail, it is necessary to plug the nares, both anteriorly and posteriorly. A long stout ligature is passed through the nostril into the mouth; by means of a flexible bougie, a loop of wire or catgut, or a springed instrument made for the express purpose. To the upper part of the oral extremity of this ligature, a portion of sponge or a dossil of lint is attached, of sufficient size to occlude the posterior opening of the nostril; and by pulling the nasal extremity of the ligature, this obstructing substance is firmly impacted; the extremity of the oral portion of the ligature remaining still pendent from the mouth.

Fig. 66.



[Bellocq's Instrument for plugging the nostrils. (From Fergusson.)—Ed.]

The anterior nostril is then filled with lint, pushed firmly from the front. After three or four days have elapsed, the apparatus is removed gently. The anterior plug is withdrawn by means of forceps; the posterior is extracted by pulling the oral extremity of the ligature, previous dislodgement, if need be, being effected by the cautious pushing of a probe passed through the nostril. Sometimes it is necessary to plug both nostrils; but, generally, the hemorrhage proceeds from one only. Constitutional treatment is not forgotten; more especially if there be reason to suppose that a hemorrhagic tendency exists in the system (*Principles*, 3d Am. Ed. p. 359).

Another method of plugging the nares has been lately proposed; by inserting a tube of vulcanized caoutchouc, and distending this either by air or water.[1]

When syncope has occurred from epistaxis, in an elderly patient predisposed to head affection, we should be very careful not to excite premature and excessive reaction, otherwise extravasation within the cranium is not unlikely to follow. The head is not to be placed low, as

[1] Lancet, No. 1870, p. 579; also Cyclop. of Pract. Surgery, p. 142.

in restoration from ordinary syncope, but should be kept elevated; and stimuli should, if possible, be avoided.

The passing of Nasal Tubes.

Flexible tubes may be readily enough passed along the floor of the nostrils into the posterior fauces; and thence they may be directed into either the larynx or œsophagus, as circumstances may require. The former destination is necessary in attempts to restore breathing, in cases of suspended animation; the latter, in order to introduce nutritive ingesta into the stomach—as in cut throat. If, in the latter case, the tube is to be left permanently inserted, the passage by the nose is plainly preferable to that by the mouth; avoiding profuse salivation, and much discomfort.

Foreign Bodies in the Nostrils.

Foreign bodies may lodge accidentally in the nasal cavities; more frequently they are introduced wilfully, by the young and inconsiderate; peas, beads, portions of pencil, and such like substances are very commonly inserted by the thoughtless child. On the foreign body decidedly disappearing inwards, the patient is alarmed; and probably makes desperate efforts to extrude it by the fingers, but with the effect only of pushing it farther into the nostril. The parent or nurse is now made aware of the circumstance, and by them similar efforts at dislodgement are made, again with the effect of causing a deeper lodgement. By this time, the foreign substance is beyond the reach of the eye; and its site is farther obscured by the slight bleeding which has probably taken place during the abortive efforts at extrusion. And in this condition the surgeon finds the case. It is well, in the first instance, to inject a stream of warm water into the nostril; it clears away coagula, loosens the foreign body, and may effect its expulsion. If not, the probe is to be used, the patient's head having been firmly secured; and the best way of accomplishing this, in the child, is to place the head firmly between the knees of the operator—unless, indeed, anæsthesia be employed, as in most cases it should be. By the probe, used gently, we first ascertain the presence and site of the foreign substance—for it may have passed outwards by the mouth, or downwards by the pharynx. Having discovered the foreign body, the flat end of the probe, slightly bent, or the scooped end of a director, or a curette made for the purpose, is passed down upon it, and insinuated past it; then, by raising the handle of the instrument, and bringing the point to bear upon the posterior aspect of the foreign substance, the latter is dislodged forwards, and may be readily removed. Forceps, however slim, are very likely to fail. They seize the anterior part of the body only; and, slipping, have the effect of causing a firmer and deeper impaction.

Congestion of the Schneiderian Membrane.

The lining membrane of the nostrils is liable to become the seat of a minor inflammatory action, chronic and unimportant as regards struc-

tural change, but troublesome and inconvenient by its continuance. There are redundancy of secretion (often fetid), uneasy sensation, and a feeling of stuffing in the part; not unfrequently the tone of voice is considerably impaired, and the sense of smell may also be rendered imperfect. Many of the symptoms of mucous polypus are present, and careful exploration by the nasal speculum is necessary to insure accuracy of diagnosis. If the action be at all of an acute nature, a few leeches may be required, more than once, applied directly to the membrane by means of a suitable glass tube; and in the passive form of congestion, leeching may also be expedient, once, to unload the vessels of the part. Then astringents are employed, solutions of nitrate of silver, sulphate of zinc, chloride of soda, alum, matico, &c., and these are patiently persevered with, either singly or combined. But in all cases an especial regard must be had to the state of the general system. Usually an atonic condition is found, and the greatest benefit is derived from sustained exhibition of the chalybeates. In very many cases, indeed, without this tonic general treatment, all local care would prove of but little avail.

Abscess of the Septum Narium.

Abscess may form beneath the mucous covering of the septum, and, when acute, the inflammatory action which causes it is usually the result of external violence. The chronic form may be independent of all apparent exciting cause, occurring in a patient of broken-down system, probably a victim of the mercurio-syphilitic taint. The bulging swelling is apt to simulate the growth of polypus. During the nascent stage, leeches are to be applied to the part, and other suitable antiphlogistics employed, to prevent suppuration if possible. When matter has formed, an evacuating incision cannot be made too soon, in order to save the cartilage, otherwise great deformity may ensue, by a falling in and shrinking of the most prominent part of this important feature.

Ulcers of the Nostrils.

1. *Simple ulceration* of the Schneiderian membrane is liable to occur from the ordinary exciting causes of ulceration of mucous tissue (*Principles*, 3d Am. Ed. p. 389), exposure to cold, contact of acrid matter, irritation communicated from diseased teeth, &c. The treatment accordingly consists, first, in taking away the exciting cause, seclusion from atmospheric exposure, discontinuance of snuff-taking, removal of diseased teeth or stumps in the upper jaw. And then, according as the ulcer manifests the inflamed, irritable, or weak characters, the applications are bland and soothing, or nitrate of silver in substance or solution, or various gently stimulant lotions (*Principles*, 3d Am. Ed. p. 229, &c.).

2. *Mercurio-Syphilitic ulcers* not unfrequently form in this situation, of a secondary, or more commonly of a tertiary character (*Principles*, 3d Am. Ed. p. 74). They are obstinate, and likely to resist all mere local treatment. The more important remedial agents are those which affect the system, especially the iodide of potassium and sarsaparilla.

3. *Ozæna.*—By this term is understood an unhealthy ulceration of the lining membrane of the nose, with affection of the subjacent bone, caries, necrosis, or both combined. Discharge is profuse and offensive, the ulceration tends rather to spread than to heal, portions of bone from time to time come away, the nose sinks inwards, and is more or less deformed, both articulation and respiration are interfered with, and ultimately the general health may seriously give way. The nasal bones themselves may perish and exfoliate, and then the deformity is not only great but almost irremediable. The peculiarity of this ulcer is, that the ulceration is of a spreading character, simply acute, or slowly phagedænic, and that the bones are more or less extensively involved. In the adult, few examples will be found in which the abuse of mercury, for syphilitic or other ailments, cannot be traced out as the paramount cause. In children, the affection would seem to be connected with the strumous cachexy.

Treatment is mainly constitutional, as in the simple mercurio-syphilitic sores, without affection of bone. Besides the iodide of potassium, and sarsaparilla, arsenic is found a very useful internal remedy, steadily persevered with, in small doses. In obstinate cases, benefit has often resulted from exhibition of the liquor hydriodatis arsenici et hydrargyri, a powerful alterative.[1] The local applications are necessarily varied. At first bland and tepid injections are advisable, afterwards those which are stimulant and alterative. A weak solution of arsenic, solutions of the nitrate of silver, sulphate of zinc, &c., may be employed, as circumstances seem to indicate. Throughout the cure, the chlorides should be used, at least occasionally, as correctives of fœtor. By some, the following combination is held in high repute: an injection composed of from one to two drachms of chloride of lime, rubbed up with thirteen ounces of decoction of rhatany root, strained after standing half an hour. In scrofulous cases, ordinary antistrumous constitutional treatment will, of course, not be neglected.

4. *Lupus*, or *Noli me tangere*, is a confirmed phagedænic ulcer, commencing usually in the upper lip, or at the exterior of the nasal cavity, spreading upwards, inwards, and around, but more in breadth than in depth, often healing at one part, while it extends at another, ultimately involving the bones, denuding them, and inducing, by caries or necrosis, such deforming results as at an earlier period follow on ozæna. In advanced cases, the soft parts of the nose, and not a little of the hard, may be wholly destroyed, while an unseemly chasm has also been made in one or both cheeks. The destructive action may proceed still more extensively, producing deformities more and more hideous, and ultimately proving fatal by hectic exhaustion. The disease is most common in adults, of the poorer sort, ill-fed, ill-clothed, scrofulous, or tainted in system by mercury, and too probably also given to habits of intemperance. Sometimes, however, it attacks the most careful and correct. As in other phagedænic ulcers, the action may be either chronic or acute (*Principles*, 3d Am. Ed. p. 248).

Treatment is partly constitutional, such as recommended in ozæna,

[1] Dublin Journal of Medical Science, September, 1840, p. 98.

partly local, consisting of such applications as are found most suitable for arrest of phagedæna (*Principles*, 3d Am. Ed. p. 249). An escharotic, such as chloride of zinc, nitric acid, or nitrate of mercury, is first employed, and then the sore is subsequently treated according to the characters which it presents. When it threatens to become irritable, and verges again towards phagedæna, a weak solution of arsenic is found of much service. Of escharotics, the chloride of zinc is perhaps most employed, in the form of paste, and is especially useful when bone has become affected, for it seems to hasten exfoliation. Occasional use of the simpler chlorides is as essential as in ozæna. Sometimes repeated leeching is useful. After arrest and cicatrization, the greatest constitutional care is still required, otherwise reaccession of the disease is extremely probable.

5. *Cancerous ulcer* may implicate the nose, by extension from the face, or may originate in the former site. It is amenable to but one treatment, early removal by knife or escharotic, or by both.

Rhinoplastics.

When the soft parts of the nose have been destroyed, partially or wholly, by wound, ulceration, or sloughing, they may be restored in some measure by transplanting a compensating amount of cutaneous and subcutaneous tissues, borrowed from an adjoining part. When ulceration has been the destroying agent, no restorative operation is ever to be attempted, until satisfactory evidence have been afforded that all ulceration has ceased, and is not very likely to return on the application of a common exciting cause of inflammatory action. Under any circumstances, it is plain that the sequela of lupus presents a much less favorable prognosis than when the cicatrix is the result of wound, or any other simple casualty.

When almost the entire organ has been removed, its restoration is attempted as follows: A piece of card or leather is shaped of the required dimensions, to constitute new alæ and apex, the columna being left for an after proceeding. And this outline of the new structure should always be rather too large than otherwise, there being great tendency to shrivel by absorption, after the flap has become fixed in its new locality. The edges of the cicatrized sore, on which the borrowed flap is to be adjusted, are made raw by the knife. The outline of the flap is then laid flat on the forehead, the fundus pointing upwards, the neck resting between the eyebrows. It is there steadily held by an assistant, while the surgeon, with ink, or at once with the knife's point, draws its boundaries. Thus defined, it is carefully dissected down, of uniform thickness, until the narrow part is reached, and then the incisions are carried to a greater depth, to insure an abundance of vascular supply. In no part of the wound is the pericranium interfered with, and, if possible, the flap should not be made to encroach upon the hairy scalp, for obvious reasons. The neck of the flap is made sufficiently long to admit of its being twisted, without serious interruption to the circulation, and to facilitate this movement the knife is carried lower down on that side to which the twist is to be made. A little time is

allowed for the oozing of blood to cease, then the flap, having been twisted so as to bring the integument upwards, is adjusted to the rudiments of the old feature, carefully and accurately, by the requisite number of points of interrupted suture, and support is afforded to the flap beneath, by the lodgement of dossils of lint, so as to give that prominence and character which seem best suited to its new office of repair and imita-

Fig. 67.

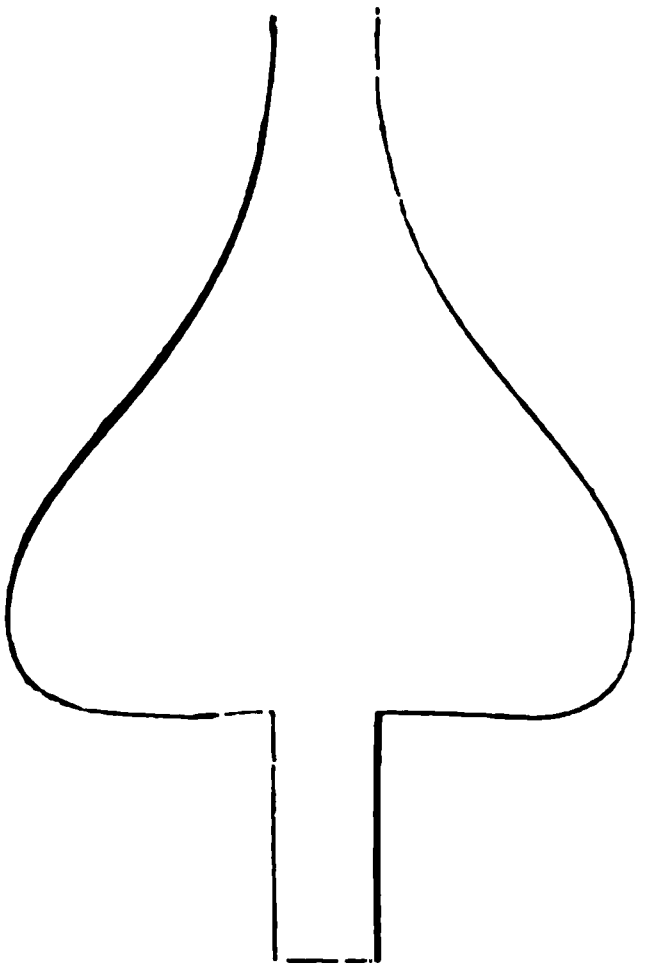


Fig. 67. Plan of Flap for a new Nose, according to the original Indian method, columna, apex, and alæ being all made at once.

Fig. 68.

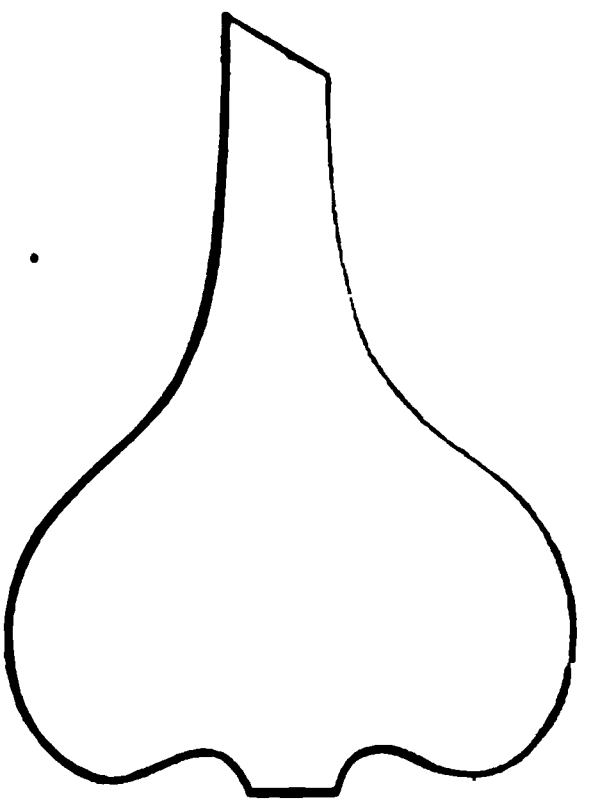


Fig. 68. Plan of Flap for a new Nose, as modified by Mr. Liston. The apex and alæ provided for; the columna to be brought, subsequently, from the upper lip.

tion. The lower part of the wound in the forehead is brought together by suture, and may unite by the first intention; the rest is covered with water-dressing, and left to granulate. The flap adheres, in part by adhesion, in part by granulation; the stitches are cut away at the ordinary period; and the interior stuffing is changed from time to time—medicated, if necessary. Ultimately—in twelve or fourteen days, usually—the borrowed substance becomes firmly seated in its new abode; and then attention is directed to the connecting slip. If the ossa nasi have been left entire, with their integument, the apex and alæ only having been destroyed, the connecting slip may be divided and removed. A wedge-shaped portion is taken away by means of a narrow bistoury; and adjustment is effected with the integument beneath, made raw by the knife for reception. But if the ossa nasi have been lost, it is well to leave the medium of attachment uninterfered with; only securing its incorporation with the subjacent surface; for, by its continued presence, the want of prominence which the loss of the nasal bones could not fail otherwise to produce, will be very much compensated. Besides, continued nutrition of the transplanted flap will be fully secured, and its shrivelling by atrophy may be, in a great measure, prevented. If the prominence should threaten to be excessive, it may be reduced by compression suitably applied.

Certain precautions are always to be attended to in such proceedings. As already stated, the flap should at first seem too large; if neatly fitting at the time, it is sure to prove insufficient afterwards. Twisting is effected very gently and carefully, lest strangulation ensue. Should engorgement occur, relief is to be obtained for the passively congested vessels, by punctures, or by drawing blood from the still raw edges. Erysipelas may supervene; if it does, the transplanted part need not be exempted from puncture or incision, if these be deemed necessary; for experience declares it to possess at least an equal tolerance of such remedial treatment as the original textures.

When peculiar circumstances render the ordinary operation impracticable, the flap may be taken from the hairy scalp, as practised by Dieffenbach; the hair having been previously removed by means of the bichloride of mercury in solution; and the flap being connected with a long narrow strip of the integuments of the forehead.

When consolidation of the new alæ and apex has been duly effected, formation of the columna is then proceeded with, according to the method first proposed by Mr. Liston.[1] The centre of the upper lip is found tumid and elongated; in consequence, removal of a portion of the redundancy would of itself be a considerable improvement; and when the portion so removed can be converted to the useful purpose of constituting a most efficient new columna, the expediency of the proceeding becomes very apparent.

"The inner surface of the apex is first pared. A sharp-pointed bistoury is then passed through the upper lip—previously stretched and raised by an assistant—close to the ruins of the former columna, and about an eighth of an inch on one side of the mesial line. The incision is continued down, in a straight direction, to the free margin of the lip; and a similar one, parallel to the former, is made on the opposite side of the mesial line, so as to insulate a flap about a quarter of an inch in breadth, and composed of skin, mucous membrane, and interposed substance. The frænulum is then divided, and the prolabium of the flap removed. In order to fix the new columna firmly and with accuracy in its proper place, a sewing-needle—its head being covered with sealing-wax to facilitate its introduction—is passed from without through the apex of the nose, and obliquely through the extremity of the elevated flap; a few turns of thread over this suffice to approximate and retain the surfaces. The flap is not twisted round as in the operation already detailed, but simply elevated, so as to do away with the risk of failure. Twisting is here unnecessary; for the mucous lining of the lip, forming the outer surface of the columna, readily assumes the color and appearance of integument, after exposure for some time, as is well known. The fixing of the columna having been accomplished, the edges of the lip must be neatly brought together by the twisted suture. Two needles will be found sufficient, one being passed close to the edge of the lip; and they should be introduced deeply through its substance—two-thirds, at least, of its thickness being made superficial to them. Should troublesome bleeding take place from the coronary artery, a needle is to be passed

[1] Practical Surgery, p. 253.

so as to transfix its extremities. The whole surface is thus approximated; the vessels being compressed, bleeding is prevented; and firm union of the whole wound is secured. The ligature of silk or linen, which is twisted round the needles, should be thick and waxed; and care must be taken that it is applied smoothly. After some turns are made around the lower needle, the ends should be secured by a double knot; a second thread is then used for the other needle, and likewise secured. With the view of compressing and coaptating the edges of the interposed part of the wound, the thread may be carried from one needle to the other, and twisted around them several times; but, in doing this, care must be taken not to pull them towards each other, else the object of their application will be frustrated, and the wound rendered puckered and unequal. Last of all, the points of the needles are to be cut off with pliers. No farther dressing is required. The needles may be removed on the third day; their ends are cleaned of coagulated blood, and, after being turned gently round on their axis, they are cautiously withdrawn, without disturbing the threads or the crust which has been formed about them by the serous and bloody discharge. This crust often remains attached for some days after removal of the needles; and, besides forming a bond of union, is a good protection to the tender parts. Some care is afterwards required, from both surgeon and patient, in raising up the alæ, by filling them with lint—thus compressing the pillar, so as to diminish the œdematous swelling which takes place in it, to a greater or less degree, and repressing the granulations. It is, besides, necessary to push upwards the lower part of the column, so that it may come into its proper situation; and this is done by the application of a small round roll of linen, supported by a narrow bandage passed over it, and secured behind the vertex."

Partial Restoration of the Nose.

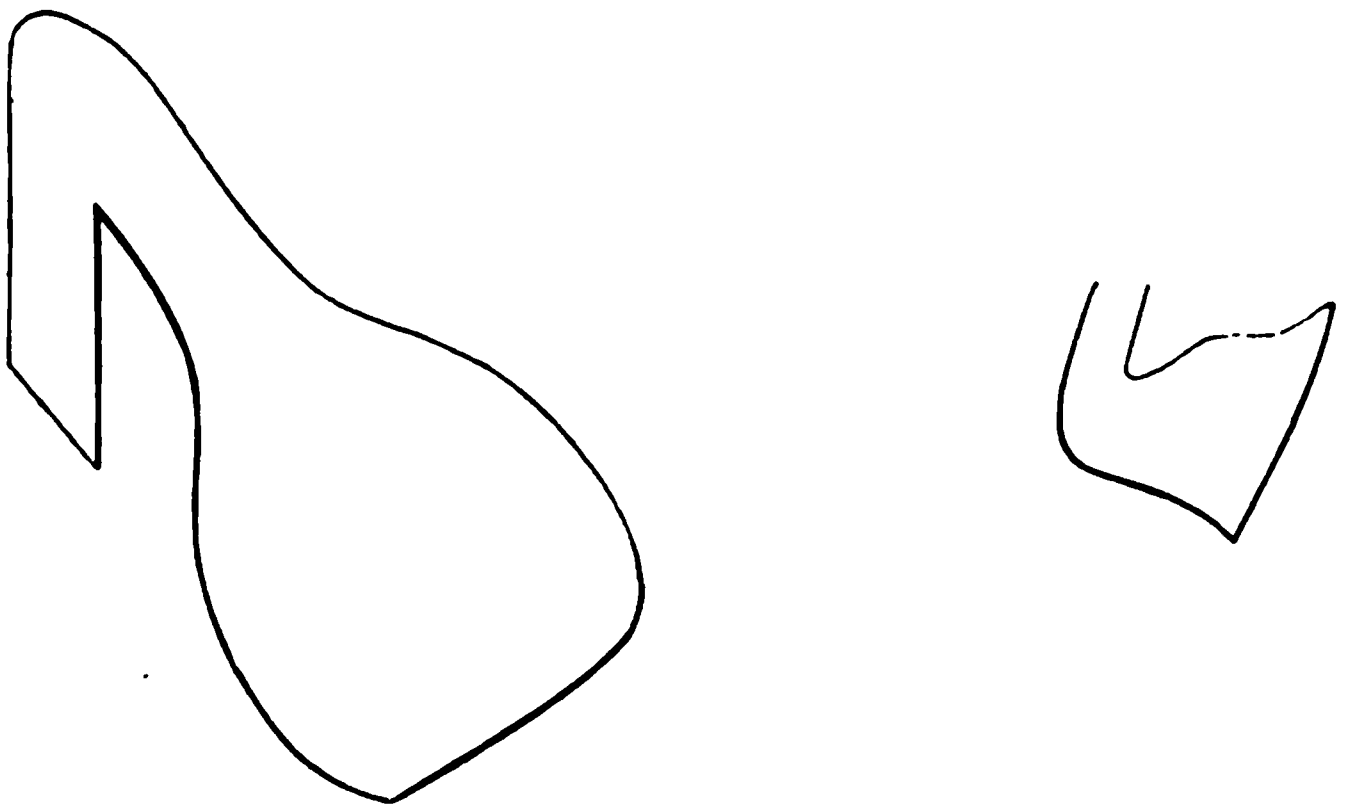
When a portion of either ala is destroyed, the deficiency may be readily supplied from the adjoining cheek; if there be the ordinary fulness there. The flap is raised, transplanted, and has its vascular supply maintained, by conducting the operation in the same way as for restoration of the whole organ. The wound in the cheek may, generally, be approximated entirely; and, in consequence, may be expected to unite by the first intention.

The entire ala may be restored in a similar way. But if the cheek be either naturally spare, or already occupied by cicatrices, the flap must be brought from the forehead. An operation is performed, similar to that for restoration of the whole organ, but on a minor scale. When the ridge of the nose is long, it is well to make a suitable furrow in its centre—by incision—for reception of the long connecting slip; which, otherwise, finding itself but indifferently supported on the exterior of the nasal integument, might fail to afford due nourishment to the flap, and induce its sphacelation. After union has occurred throughout the whole wound, the connecting slip may be raised from its temporary bed, and the raw edges of its site approximated; or it may be left undisturbed, according as circumstances may seem to indicate.

Loss of the apex and both alæ is supplied by a frontal flap; with or without lodgement of the connecting slip, according to the length of the nasal ridge.

The ridge itself, when deficient, may be restored by a frontal flap,

Fig. 69.



"The Alæ of the Nose; deficiencies in the upper, anterior, or lateral parts of the organ, in the forehead, &c., may be supplied from the neighboring integument, on the same principle as the preceding repairs. In many of these operations the flap can be so contrived and cut out, as that it can be applied without its attachment being twisted. The form of such flaps is here given." (Liston.)

very readily and efficiently; either by adapting a suitable portion to its surface, made raw; or by inserting a slip into a sulcus made for its reception. By cutting out the depressed portion, and approximating the margins of the wound by suture, depression may be removed, in some cases satisfactorily; but, in most, such an attempt would be followed by an elevation of the apex causing a deformity little less unseemly than the original.

When the columna alone is deficient, the operation for its restoration is performed, as detailed at p. 175.

Not unfrequently, the columna, and the integumental part of the alæ and apex, remain entire, while the cartilaginous texture has suffered more or less dilapidation; and the nose, in consequence, shrinks, falls inwards, and is much deformed. Autoplasty is not required to remedy this case. In some examples, it is sufficient to divide carefully the abnormal adhesions within, to elevate the nostrils then to their normal level, and to maintain this elevation subsequently by suitable stuffing of the cavities. In other cases, however, such manipulation is found insufficient; and then it is expedient to approximate the cheeks, so as to force the nose into increased prominency; the original insertions of the alæ on the cheek having been previously detached, by subcutaneous incision. The organ, thus rendered movable, is transfixed at its base horizontally, by silver needles, which are made to perforate a piece of leather, or wood, after emerging from the nose; and by twisting the

extremities of the needles, on this exterior foreign substance, the due amount of approximation is effected and maintained.[1]

When there is both depression of the alæ and apex, and loss of the columna, the depression is first to be removed; and then a new columna is to be constructed in the ordinary way.

But, in truth, no exact details can be established for any autoplastic or simply restorative operation on this organ; the proceedings must vary, in almost every case, according to its peculiar circumstances.

It is right farther to state that the majority of such operations come under the category of those of "complaisance,"—undertaken under no absolute necessity, but rather to please the patient—proverbially prone to untoward casualties in the after treatment. The flap may shrink or slough; ulceration may recur; erysipelas, phlebitis, pyæmia, may peril existence. And, at the same time, it is to be remembered that a very passable substitute for the lost organ may be adapted by the mechanic, without pain or danger.

For farther information on Rhinoplastics, the student is referred to the Practical Surgery of Mr. Liston, and the writings of Dieffenbach—who, in this department, bid fair to rival the fame even of Tagliacotius. [See also reports of operations by J. M. Warren, M. D., Boston Med. and Surg. Journal, vols. xvi., xxii., and xxviii., and Am. Journal, vol. xx.; by Dr. Mütter, Am. Journal, vol. xxii.; and in Am. Ed. of Liston's Practical Surgery; by Dr. Pancoast, Operative Surgery.—Ed.]

---

[1] Fergusson's Practical Surgery, Am. Ed. 1853.

CHAPTER VII.

AFFECTIONS OF THE SUPERIOR MAXILLA.

Collection of Fluid in the Antrum.

THE antrum is liable to become the seat of a chronic collection of fluid, whereby its parietes are expanded and attenuated, and its cavity much enlarged. The condition is ordinarily termed abscess; but it seems very doubtful if this appellation be accurately applied. The fluid may be puriform, but is seldom purulent. It is more like what is usually found in serous cysts; sometimes thin and serous, sometimes glairy, sometimes sanguinolent, sometimes puriform, not unfrequently mingled with more or less of solid curdy matter. The parietes of the cavity are not thickened by fresh osseous deposit, as in chronic abscess; on the contrary, they are simply expanded, becoming thin, and in some places perhaps deficient—the loss being supplied by membranous structure, contributed probably by the periosteum. In short, the morbid condition more resembles that of osteo-cystoma, than that of chronic abscess of bone (*Principles*, 3d Am. Ed. p. 408).

The symptoms are uneasy sensation in the part; swelling of the cheek, which ultimately crackles on pressure, and may be felt to fluctuate—the parietes having become much attenuated; the palate may bulge considerably downwards; sometimes there is increased secretion from the corresponding nostril; and from the hanging and stiffness of the lip on that side, articulation may be interfered with. The change may be attributed to a slight and remote injury; or to the presence of decayed teeth in the corresponding maxilla; but very frequently, there is no assignable exciting cause.

The remedy is by evacuation; and the aperture must be both free and dependent. An aperture sufficiently dependent may be formed in the corresponding alveoli of the canine or first molar teeth; and sometimes a communication is found already established there, on removal of the decayed teeth or stumps. But such an opening is seldom if ever sufficiently free, when of spontaneous formation; indeed, sufficient space is not readily obtained at this part, even by operation. And it is essential that the opening shall be of some considerable size; otherwise the fluid will not escape by it; but will be retained by atmospheric pressure—as in the case of the narrow-necked bottle, which, when filled with water, is suspended in an inverted position for barometric purposes. It is better to make an opening through the most dependent part of the attenuated parietes, above the first molars. The membrane of the cheek is incised there; and, by means of the same instrument—a strong

bistoury—the parietes of the cavity may also be perforated, in the greater number of cases. If the bone, however, prove thick and resisting, a pointed lever, as used for the extraction of decayed teeth, may be employed. An aperture having been made of sufficient dimensions to admit the point of the little finger, through this the contents readily drain away. Besides, reaccumulation is effectually prevented; and, by pressure from without, return to the normal state by contraction is favored.

Abscess of the Antrum.

The lining membrane may undergo inflammatory action, with or without the application of external violence; and suppuration may ensue. The action may be either chronic or acute. In the former event, the case will very much resemble the cystic enlargement just detailed. This, however, is of rare occurrence, and is usually unconnected with external injury.

Acute abscess generally results from violence applied, or from irritation communicated by decayed teeth or other affections of the gums. The symptoms are severe. With a considerable amount of constitutional disturbance, there are deep-seated and great pain, tension and throbbing, and swelling of the superimposed soft parts. Usually, partial evacuation takes place, spontaneously, by the side of a tooth; with relief from the more prominent symptoms. Such imperfect evacuation and relief, however, are not enough; the operation, above the bicuspid teeth, as for emptying the indolent fluid collection, must be had recourse to. But, of course, in the first instance, attempts are made to forego the necessity of all operative interference, by timeously arresting the inflammatory process, if possible, ere matter has at all formed. When purulent accumulation has taken place, the artificial opening cannot be too soon established. For, from the turgid state of the membrane, it is very obvious that no partial relief can be expected from spontaneous evacuation through the nasal aperture—as sometimes happens in the indolent collection of fluid.

Fig. 70.

Enlargement of the Antrum, by accumulation of fluid within.

Polypus of the Antrum.

The lining membrane of this cavity, like that of the nostrils, may give origin to polypous formations. But the occurrence of benign polypi here is comparatively rare. The medullary formation is not uncommon; constituting the origin of osteocephaloma, as affecting this bone; and amenable to the ordinary rules of treatment (*Principles*, 3d Am. Ed. p. 457).

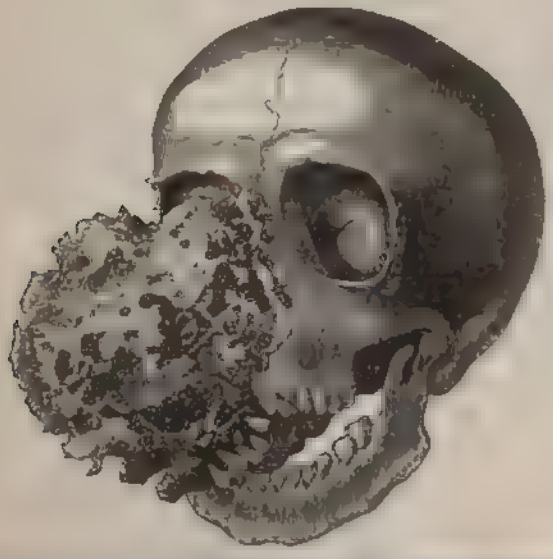
Did plain indications exist of the presence of a benign polypus—

mucous or fibrous—within the antrum, it would certainly be our duty to expose the cavity, by suitable incision, from the mouth; with or without division of the lip; and to eradicate the morbid growth thoroughly. Such cases, however, are extremely rare.

Tumors of the Superior Maxilla.

Two forms of tumor are liable to occur in this bone: Osteosarcoma

Fig. 71.



Large Osteosarcoma of Upper Jaw, macerated, showing the osseous stroma. Still limited to the superior maxilla, in which it originated. (Howship.)

and Osteocephaloma; tumors very different in themselves, and requiring very different treatment. The one, early irremediable; the other, capable of cure at an advanced date, and after a large or even enormous size has been attained (*Principles*, 3d Am. Ed. p. 457).

The *osteosarcoma* may reach a large size by external bulging, and by expansion of the bone; but, unless it degenerate in structure, it remains limited within the confines of the superior maxilla; and, consequently, by removal of that bone alone, the whole of the diseased formation may be taken away. The swelling projects into the fauces, into the mouth, and outwards on the cheek; the main protuberance is in the last-named direction, interfering with articulation, mastication, and vision; a thin serous discharge escapes by the mouth, seldom bloody, and seldom offensive; and the general health may be hale in all respects. The remedy is excision of the superior maxilla; and this, though a severe and somewhat difficult operation, may be fearlessly undertaken, even in the most advanced cases of this disease—if genuine; experience having proved that the issue of such operations is almost invariably prosperous.

The *osteocephaloma* may be of original formation, or may be the

result of osteosarcoma degenerated. When of the former character, the diseased formation has extended beyond the limits of the superior maxilla, ere any considerable prominence has appeared externally. The outward tumor may be yet trifling, while the mouth and fauces are completely occupied, and the base of the cranium hopelessly involved. The system, too, is already worn by malignant hectic. In such cases, we cannot—by excision of the superior maxilla, the palatine bones, and the malar—hope to take away the whole of the tumor; a portion remains, deep-seated and inaccessible; from this, reproduction of a tumor, soft, fungated, and bleeding, takes place; and a most disastrous issue is precipitated. Or, not improbably, the already much enfeebled system speedily sinks under the immediate effects of the operation, ere ever a new production has had time to form. In short, while we may perform excision of the upper jaw with the best prospect of success, even at a late period of the case, in *osteosarcoma*, we ought to refrain from operation in all examples of *osteocephaloma*, excepting those in which we are satisfied that the disease is yet recent, and limited to the bone in which it began—and such cases are very rare.

Extirpation of the Superior Maxilla.

The patient is seated firmly on a chair, or reclines on a table with the head and shoulders considerably elevated; for so the manipulations of the surgeon are facilitated, and the outward escape of blood is favored. As elsewhere stated (*Principles*, 3d Am. Ed. p. 730), my own impression is, that anæsthesia by chloroform is at least of doubtful propriety here. The experience of others, however, among whom I may place the high authority of Mr. Lawrence, testifies that this important agent may be employed, under due precaution, even here, with perfect safety. If used, every care must be taken to prevent the main risk, namely, asphyxia, by accumulation of blood in the air-passages.

Fig. 72.

Tumor of the Upper Jaw; showing the lines of incision for removal.

The jaw having been made clear of teeth at the point where section is intended to be made, a strong bistoury is inserted near the inner corner of the eye, over the nasal process of the superior maxilla, and is brought down to the mouth; cutting the lip in the mesial line, and dissecting the ala of the nose from its basis. The knife is again entered over the external angular process of the frontal bone, and carried obliquely downwards to the angle of the mouth; dividing the whole thickness of soft parts. The flap, indicated by these two incisions, is then dissected upwards off the tumor; and

is held raised by an assistant. The orbital contents are separated from the bone, on their lower aspect; and are gently elevated and protected by a flat copper spatula, which is also retained by the assistant. The soft palate is incised in the mesial line, correspondingly with the wound of the lip; and, by cross cutting, the pendulous velum of the palate is separated from the doomed parts—now isolated, so far as the soft textures are concerned. By a small saw—stronger and longer than what is ordinarily sold as Hey's—the union between the maxilla and malar bone is severed. By the same instrument the alveolar process is cut through, at the part exposed by the labial wound; and a groove is also made in the palatine process, at the part incised. A pair of stout and long bone-pliers may then be used to complete the section at this part; one blade resting in the palatine and alveolar groove, the other passed into the corresponding nostril. If such an instrument be not at hand, however, the section may be completed readily enough by means of the saw alone. The nasal process is severed by the ordinary cutting pliers. And, now, by pressing the tumor downwards, it is dislodged from its connections; while complete separation is readily effected by touching with the knife those soft parts which require its edge. The velum of the palate, formerly separated, is carefully preserved—and, if possible, also the palatine plate of the palate bone. One or two vessels, hanging in the deep wound, will probably require ligature; and the facial

Fig. 78.

Portrait after removal of the Upper Jaw, for Osteosarcoma. An example of how little deformity may in some cases remain.

vessels, which during the operation were restrained by the fingers of an assistant, are also secured. The amount of deep bleeding is often but slight; the vessels being torn, not cut, during evulsion of the tumor.

The vacant space, having been cleared of coagulum, is filled with lint; and over this the flap is replaced. · Both incisions are then brought together with great accuracy, by means of the twisted and interrupted forms of suture; treatment is conducted for adhesion; and, generally, this does not fail to occur, in almost the entire extent of the facial wound. The deep cavity of course inflames and suppurates. The lint loosens, and is brought away. A less amount of dressing is daily renewed, medicated with a weak solution of the chlorides; granulation advances, and cicatrization is in due time obtained. In some cases, a marked deficiency remains; and this may be remedied by the skill of the dentist. But in other cases, the deficiency is wonderfully atoned for, by nature's effort alone; partly by the formation of new matter, partly by contraction and accommodation of the old.

When the tumor is of large size, the malar bone is encroached upon, and has to be taken away along with the maxilla. In such a case, a third incision is made along the zygoma, terminating in the upper part of that which passes from the outer corner of the eye to the angle of the mouth; the zygomatic and orbital processes being divided by the bone-pliers.

If the tumor be small, one incision may suffice—that from the outer corner of the eye to the angle of the mouth; it being quite possible to expose the parts sufficiently, by raising the triangular flap while the lip and front-face are retained entire.

Dieffenbach's mode of procedure is as follows: Having made the central incision by the side of the nose, the knife is carried across beneath the eye to the temple; and the flap, thus indicated, is dissected off. This admits of a thorough exposure of the tumor; subsequent deformity by the cicatrix is comparatively slight; and paralysis from division of the facial nerves will probably be avoided.

[In a case of scirrhus of the antrum, Dr. Horner, of this city, removed the whole of the upper maxillary bone of the left side without making any external division of the cheek; the patient being thereby saved the unsightly scar which is left after the ordinary operation. For an account of this operation, and of several others performed by American surgeons, see Smith's *Operative Surgery*, Philadelphia, 1853.

In removing the upper maxillary bone, it is obviously a matter of great importance to preserve, if possible, *the floor of the orbit intact*, in order that the eyeball and lower lid may be sufficiently supported. This can best be accomplished by the plan recommended by Dr. Mussey, of Cincinnati. It consists in separating the *maxillary* from the *malar* bone by running a narrow saw downwards and outwards from the orbit, through the latter bone, just outside of the malo-maxillary suture, nearly parallel with that suture, and extending the cut to the spheno-maxillary fissure. The nasal process is to be sawn at its base, downwards and inwards, from the orbit to the nostril, in order to disturb as little as possible the lachrymal canal (*Trans. Am. Med. Association*, vol. iii. p. 364).—Ed.]

If any doubt should occur to the surgeon as to the solidity of the growth, an exploratory puncture should be made in the direction of the

antrum, previous to operation; for excision of the upper jaw is rather too severe a remedy in the case of mere distension of the antrum by accumulation of fluid.

See Bibliography of Diseases of Bones, in Principles of Surgery; also Lizars, London Medical Gazette, vol. v. p. 92; and System of Anatomical Plates, part. ix. Edin. 1826 (where excision of the superior maxilla is first proposed); Blandin, Gazette Médicale de Paris, vol. ii. 1834; Guthrie, Medical Gazette, vol. xvii. 1835; O'Shaughnessy on Diseases of the Jaws, &c., Calcutta, 1844; Liston's Practical Surgery, last edition; Liston on Tumors of the Face, Med. Chir. Trans. vol. xx.; Dieffenbach's Operative Surgery, Leipsic, 1848.

CHAPTER VIII.

AFFECTIONS OF THE FACE.

Wounds.

Wounds of the face are apt to bleed freely, and usually require deligation of the vessels. Coaptation should be most carefully affected, and adhesion courted, in order to avoid deformity by cicatrization, as much as possible. Transverse wounds may interfere unpleasantly with the parotid duct, and, by division of the branches of the portio dura, may paralyze the cheek, at least for a time. After cicatrization, resumption of the nervous function may be expedited by friction.

Warts.

Warts not unfrequently form on the integument of the face. They should not be allowed to remain, for, by the time old age has supervened, they will be found either already degenerated, or prone to become so. It is well to remove them early, by the ordinary means (*Principles*, 3d Am. Ed. p. 386), while they are yet simple.

Erysipelas.

Erysipelas seldom assumes the phlegmonous form in the face. Punctures, consequently, suffice for abstraction of blood, and relief of tension. They may be made freely, for the cicatrices leave no unseemly trace. After disappearance of the main attack, the patient must be carefully watched for some days, reaccession, with secondary abscess, being very apt to occur in the areolar tissue of the lower eyelids (*Principles*, 3d Am. Ed. p. 366). As in erysipelas of the scalp, cold, and other repellent applications, should never be employed.

Spasm.

Spasmodic twitching of the muscles on one side of the face, the orbicularis oculi, the levators and retractors of the upper lip, and the corresponding movers of the nose, is an unpleasant affection of no uncommon occurrence. Often it will yield to general treatment, more especially to rectification of the primæ viæ. Sometimes, also, patient counter-irritation is of use, directly over the part, and probably the preferable mode of applying this is by rubbing on nitrate of silver in

substance, so as to vesicate. In chronic and obstinate cases, tenotomy has been had recourse to.[1] In one example, permanent cure followed subcutaneous division of the zygomatici, the levator anguli oris, a portion of the orbicularis oculi, and the depressor alæ nasi. In order to restrain hemorrhage, and consequent ecchymosis, likely to result from such a cross-wound of the face, accurate pressure is necessary immediately after withdrawal of the knife.

Neuralgia.

Neuralgia affecting the branches of the fifth pair of nerves is termed *Tic Douloureux*, at once, unfortunately, one of the most distressing and most unmanageable affections to which the human frame is liable. The treatment is supposed to fall within the peculiar province of the physician, and consists in carrying out the general principles on which the management of neuralgia is ordinarily conducted (*Principles*, 3d Am. Ed. p. 587). At one time, the surgeon's aid was not unfrequently called upon, division of the trunk of the affected nerve being supposed likely to afford at least an alleviation of the distressing symptoms. Experience has proved, however, that such an operation is in most cases inexpedient; the relief, if any, is but partial and temporary, and the neuromatous enlargements, which form on the truncated extremities of the nerve, are likely to produce ultimate aggravation. The operation, in truth, may be the means of converting an example of neuralgia, unconnected with structural change in any part of the nerve, into a worse form, dependent on structural change, not only considerable but probably irremediable. Sometimes the operation has proved successful upon one nerve, only to drive the neuralgia to another, perhaps inaccessible. Very seldom does it effect a complete cure.

Tumors of the Cheek.

Tumors form in front of the ear, and are of various kinds. They may be simple, fatty, fibrous, or cystic. Calcareous formations, too, are not unfrequent, the earthy matter being deposited in the stroma of a chronically enlarged lymphatic gland. In removing such growths by the knife, the greatest caution should guide the movements of the hand, lest the branches of the portio dura be cut across, and paralysis of the cheek ensue, and lest by division of the parotid duct, salivary fistula be established. In order to meet such indications, the dissection should be proceeded with in the direction of the endangered parts, horizontally, contravening the general rule of cutting in the direction of subjacent muscular fibre.

Tumors of the parotid are rare, fortunately. For this gland is so situated as to render extirpation of it, entire, even in the healthy state, an operation of extreme difficulty. If it be the site of a benign tumor, of no great size or duration, removal may be attempted. The dissection will be deep and difficult; and, after every care, a portion of the

[1] Dieffenbach on Division of Tendons and Muscles, Berlin, 1841, p. 315.

morbid structure is likely to be left behind; but it is quite possible that reproduction may not occur. Malignant formations, however, are uniformly let alone; for in their case reproduction is certain, if any portion of the original growth, however slight, be permitted to remain.

[The reader will find a comprehensive account of this operation, with numerous practical details, in Smith's *Operative Surgery*, where the prominent part taken in it by some American surgeons is also recounted. —Ed.]

[We will also remark that Dr. Hosack, of New York, has succeeded, by ligature of the carotid artery, in causing the entire absorption of the parotid gland of the same side, in two cases of scirrhus of this organ; and, at the date of the account, a third case of the same disease was undergoing steady improvement by the same mode of treatment.—See *Walshe on Cancer*, Am. Ed. by Dr. J. M. Warren.]

Tumors over the parotid are comparatively frequent. They displace the subjacent gland, cause it to shrink by absorption, and occupy its place. Their extirpation can be effected both readily and safely.

Sinus of the Cheek.

Patients frequently present themselves under the following circumstances. They are adolescents, or recently adult; and are more frequently female than male. Many months previously, a phlegmon formed on the lower part of the cheek, over the body of the lower jaw; suppuration took place; copious discharge has continued ever since; and though many and various remedial means have been employed, cicatrization, or even marked amendment, has never been obtained. There is a weak sinuous ulcer, with a pouting external surface; and the surrounding integuments are swollen and discolored by passive congestion. In the great majority of such cases, if not in all, the exciting and retaining cause is to be found within the mouth. Opposite, or nearly opposite the affection of the cheek, a decayed tooth or stump will be found, probably imbedded in a very diseased gum. And on removal of this—and not until then—will the sinus and ulcer be brought to heal. Without extraction of the offending tooth or teeth, the most energetic and sustained practice may be put in force against the cheek, without success. After extraction, healing may occur even without any remedial means having been applied directly to the part.

Salivary Fistula.

In consequence of wound or ulcer, the duct of the parotid gland may open externally on the cheek. And by outward discharge through the fistulous aperture, not only are deformity and inconvenience occasioned, but also a serious loss is sustained of secretion, very valuable in the processes of mastication and digestion. The principles on which a cure is to be attempted are very simple; namely, the establishment of an internal opening, by which the saliva may be poured into the mouth and saved; and the shutting up of the external aperture whence this fluid has previously run to waste. A puncture is made through the

mucous membrane, communicating with the duct's cavity; and the permanency of this new passage is secured, by the lodgement of a suitable foreign substance—either left there for some days, or introduced at frequent intervals. The external aperture, having been made raw in its edges, is shut by means of a point of twisted suture. Adhesion may take place; if not, subsequent contraction is induced by the application of a heated wire, at long intervals (*Principles*, 3d Am. Ed. p. 220). Autoplasty may be of use in those cases in which there is much loss of substance, and in which the ordinary means of effecting closure have failed.

[Dr. Horner, of this city, has suggested an operation for the cure of this troublesome affection, which is very simple and easily performed. The fistulous orifice should be first slightly elongated by a simple incision made in the line of the zygomaticus major muscle; then, the patient's head being firmly supported by an assistant, who also holds a broad wooden spatula against the inside of the cheek opposite the fistula, a sharp-edged punch, like that used by saddlers, and large enough to excise the whole fistula, is pressed firmly against the check so as to remove the diseased portion entirely, and at the same time to open the duct afresh, and afford a new avenue for the escape of the saliva into the mouth. The external edges of the wound are now to be accurately closed by the twisted suture, and the cold water-dressing is to be applied until union is accomplished.

This simple procedure has proved perfectly successful in the hands of Dr. Horner, and also of Dr. Smith.—*Smith's Operative Surgery*.—Ed.]

Fracture of the Malar Bone.

This accident is rare. The deformity is considerable, and unfortunately not easily remedied; as in the following example: A lad, aged eighteen, was struck on the face by a full blow from the fist of a heavy athletic man. The zygoma had given away, and also the union between the malar bone and superior maxilla. The former bone had been driven much down, giving a remarkably sunk appearance to the face, with deficiency of orbital margin. By examination from the mouth, it was also apparent that the roof of the maxillary antrum had been broken and depressed. In addition to the deformity, the patient complained of much pain; there was also a numbness of that side of the mouth; and considerable difficulty was experienced in attempting to close the jaw, the redundant soft parts of the cheek lodging between the teeth. By pushing upwards with the finger-points, insinuated from behind, the malposition of the parts was in some degree rectified; but still considerable displacement and deformity remained.

Reich, Dissert. de Maxillæ Superioris Fractura, Berol. 1822. Cloquet, Mémoire sur les Fractures par Contrecoup de la Machoire Supérieure, Paris, 1820.

CHAPTER IX.

AFFECTIONS OF THE LIPS.

Harelip.

THIS term is applied to congenital fissure of the lip; the part so deformed being supposed to have a resemblance to the natural development of the hare. In general, there is a strong wish, on the part of the parents and friends, to trace the untoward result at birth to some sinister impression made on the mind of the mother during utero-gestation—with what success, it were more curious than useful to inquire. The affection may be single or double, simple or complicated.

Single Harelip consists of a fissure, extending through the whole thickness of the lip, usually situate on one side of the mesial line, and either partially dividing the lip, or extending completely into the cavity of the nostril. When the affection is both simple and single, there is no other deformity in the mouth; the hard and soft palates are entire and fully developed, and the gums are normal. Deformity is great, however, even in the simplest form; and the functions of the parts are also much interfered with. The only remedy is by operation; making raw the edges by incision, approximating the fissure accurately, at every point, and securing union by adhesion. The preferable period for performing this operation, probably, is after the child has passed the second year.[1] By this time the trying process of dentition has usually gone by; and there is consequently a better tolerance of pain and loss of blood than at an earlier period. Also, at this age, the patient, though unruly to its utmost, is yet easily managed and controlled; and the procedure is manifestly favorable to the due advancement of articulation, and the important educational results which follow thereon. For a like reason as in extirpation of the upper jaw, anæsthesia is here inexpedient. The child, rolled firmly up in a linen sheet —mummy-wise—with its arms by its side, is held on the lap of a nurse or an assistant, and has its head secured between the knees of the surgeon, who is seated on a chair in front of the patient and nurse. The free margin of the lip, on one side of the fissure, is taken hold of by the finger and thumb, and put on the stretch. A narrow and straight sharp-pointed bistoury is then inserted at the upper or nasal angle of the deficiency, and carried steadily downwards, after transfixion, so as

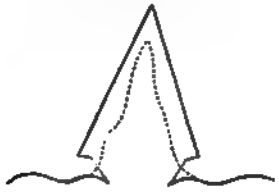
[1] The operation has been successfully performed, seven hours after birth.—*Ranking's Retrospect*, vol. v. p. 249.

to leave a smooth cut surface on the fissure's margin. The like is done on the opposite side. But in neither case is the section made complete. Near the prolabium the knife is arrested and withdrawn, and the two

Fig. 74.

The Twisted Suture.

Fig. 75.



Malgaigne's Operation. The dotted lines mark the fissure.

flaps are left pendent. The lip is temporarily brought together, and an estimate is made of how much of the lower part of these flaps should be retained, in order to fill up completely the notch which is otherwise so apt to remain at the prolabium; and, this having been ascertained, the necessary abbreviation of the pendent flaps is made by knife or scissors. The wound is then finally closed, accurately, by points of twisted suture, in the same way as in the operation for restoring the columna nasi (p. 175). For this modification of the operation, in order to obviate the prolabial notch, we are indebted to M. Malgaigne. If a pouting redundancy should be found, after cicatrization, it may easily be reduced to the proper outline, by knife or scissors if need be; but in general, absorption will render all secondary interference unnecessary.

Fig. 76.

[Instrument recommended by Mr. Fergusson.—Ed.]

[In the last edition of his *Practical Surgery* (Am. Reprint, 1853), Mr. Fergusson speaks very highly of an apparatus which he almost constantly employs, to assist the action of the sutures in maintaining close apposition of the edges of the wound. It is composed of a semicircular spring padded at both extremities, which are so applied upon the cheeks as to take off the strain from the needles. The spring is retained in the proper position by straps passing over the cranium, as seen in the figure.—Ed.]

In *double harelip*, there is a fissure extending from each nostril, and usually complete. The intermediate portion of lip may be fully developed, or it may be short and deficient. In the one case, two lines of wound are necessary—the ordinary operation being applied to each fis-

Fig. 77.

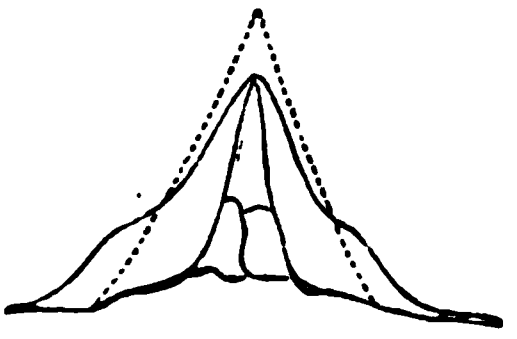


Fig. 77. Simple Harelip. The dotted lines mark the incisions, as in the ordinary operation.

Fig. 78.

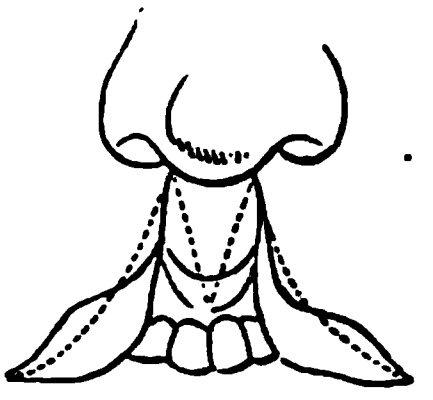


Fig. 78. Single Operation for Double Harelip. The dotted lines mark the incisions, as ordinarily practised.

sure; in the other, a single approximation will suffice—as is sufficiently illustrated in the diagram (Fig. 78).

Complicated Harelip.—Complication attends on the double form more frequently than on the single. The hard and soft palates may be cleft. Or the gum is in an abnormal state; projecting forwards between the fissures, sometimes adherent to the apex of the nose, and presenting teeth growing viciously. The abnormal state of the palate makes no difference in the operation on the lip; except to expedite its performance, in the hope that the traction so exerted may have some good effect, in favoring diminution of the palatine chasm during progressive development of the parts. In the case of projecting gum, it is usually expedient to begin the operation by removing the faulty part, on a level with the normal gum, by means of bone-pliers, and then to complete the procedure in the ordinary way. In some few cases, repression of the prominence may be effected, by adapting a springed instrument calculated to exert the necessary amount of pressure.

Ulcers of the Lips.

The lips are liable to ulceration of the ordinary kind; induced by exposure to weather, irritation of tartar or decayed teeth, gastric disorder, external injury, or direct application of an irritant cause. The prolabium is the part most frequently involved.

Treatment is begun by removal of the cause, when that is apparent; avoiding atmospheric exposure, subduing overaction caused by external injury, removing sources of irritation from the gums, discontinuing the habitual use of a short pipe, correcting the digestive organs, &c. Then applications are made to the sore, according as its appearance may seem to require; and nitrate of silver, either in substance or in solution, is found to be the application most generally useful—the ulcer usually partaking more or less of the irritable character (*Principles*, 3d Am. Ed. p. 244). Throughout the treatment, it is of great importance to secure rest of the part as much as possible. In the child of strumous habit, ulceration of the prolabium and lining of the upper lip, near its centre, is very apt to occur, with much swelling of the part; and in such cases the binding of a ribbon tightly over the lip is found to be very beneficial—securing comparative rest of the part, and promoting discussion of the swelling by pressure.

Malignant Ulcers of the lips are unfortunately by no means rare; but are peculiar to the advanced in years, as *cancer* usually is; and the lower lip is much more frequently affected than the upper. The disease may commence by carcinomatous formation of a warty character, or may exhibit at once the condition of cancer (*Principles*, 3d Am. Ed. p. 814). The most common inducing cause is the habit of smoking with a short clay pipe—which becomes hot, and irritates the prolabium—daily, or many times a day. The only remedy is by free and early removal

Fig. 79.

Cancer of the Lip. The disease too extensive for any conservative operation.

of the diseased part, while the disease is yet limited, and no involvement of the lymphatics is apparent. For superficial, suspicious sores, affecting the mere prolabium, escharotics may suffice; nitric acid, nitrate of mercury, chloride of zinc, or potassa fusa—freely applied. But when other textures are involved, the knife alone is worthy of confidence.

When the affection is mainly on the surface of the lip, the whole may be taken away, and yet with very little deformity. By two elliptical incisions, the diseased space is included; the knife being entered in the middle of the prolabial space, and made to pass first on the integumental, and then on the mucous aspect of the disease. The morbid structure, thus marked, is carefully dissected out; and then the saved integument and mucous membrane are brought together by points of interrupted suture.

Fig. 80.

When the disease is more extensive, and the lip lax, it is yet possible both to remove the diseased part satisfactorily, and to prevent any great deformity. The including incisions are made in the form of the let-

ter V, the apex pointing downwards; and with care taken that the good general rule is not transgressed, of taking away a border of apparently sound texture along with the truly carcinomatous formation (*Principles*, 3d Am. Ed. p. 317). The wound is approximated and secured by twisted suture, as for harelip.

In not a few cases, however, almost the whole surface of the lip is involved, the disease at the same time extending deeply towards the chin. Under such circumstances, we have but one paramount indication to fulfil; namely, complete excision of the diseased part; and this is uncompromisingly effected by a free sweep of the knife. Approximation is not attempted. But the part is left to granulate and heal, as ordinary suppurating wounds do. And sometimes the ultimate deficiency of lip, after such an operation, proves much less than might have been anticipated; partly on account of formation of new matter, but mainly by resilience and centripetal movement of the old textures.

The lower lip, when destroyed by carcinoma, may sometimes be restored in great measure by incision and elevation of the adjacent parts, without transplantation of flaps; as has been practised by Blasius, Dieffenbach, Serre, Syme, Lawrence, and others.[1] The operation is thus described by Mr. Syme, in a case in which removal of the cancer and restoration of the lip was done at the same time: "Two incisions were made from the angles of the mouth, so as to meet at the chin, and remove the whole of the morbid part in a triangular form. The line *a b* and *b c* being supposed to represent these incisions, I cut from the point *b* outwards and downwards, on each side, to *d* and *e*, in a straight direction, and then, with a slight curve outwards and upwards, to *f* and *g*.

Fig 81.

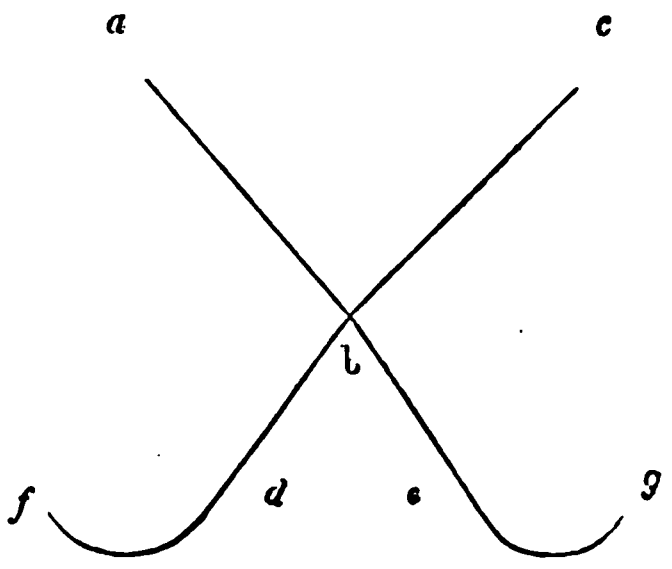
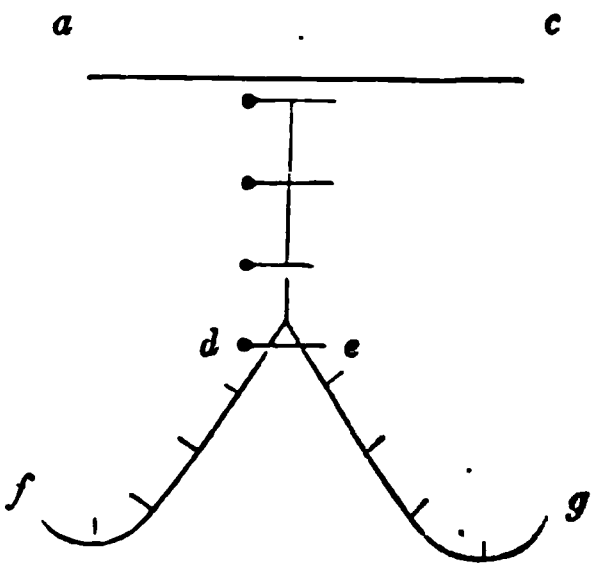


Fig 82.



The flaps *a b d f* and *c b e g* were next detached from their subjacent connections, and raised upwards, so that the edges *a b* and *c d* came into a horizontal line; while those represented by *b d* and *b e* met together in a vertical direction, and the lateral extensions to *f* and *g* allowed sufficient freedom to prevent any puckering or overstraining. The respective surfaces were lastly retained in contact by the twisted and interrupted suture; four points of the former being inserted in the middle line from

[1] See Blasius, Klinischen Zeitschrift, Halle, 1836. Dieffenbach, Handbuch der Plastischen Chirurgie, Berlin, 1838. Serre, Traité sur l'Art de Restaurer les Déformités de la Face, Paris, 1842. Syme, Monthly Journal, March, 1847, p. 642.

the lip downwards, and the same number of the latter in the curved portion on each side. The wound then presented the appearance shown by Figure 82. It healed entirely by the first intention."

Cancrum Oris.

This is an example of Sloughing Phagedæna (*Principles*, 3d Am. Ed. p. 248). It originates in the mucous membrane of the lip or cheek, and extends sometimes both rapidly and far, presenting the usual characters of that class of sore. It is almost exclusively met with in the ill-fed, ill-clothed and ill-housed children of the poor in densely populated towns. But in any child of weakly habit it may be induced by imprudent mercurialism. The constitution sympathizes greatly; in the form of irritative fever, tending to the typhoid character. Treatment consists in amending the outward condition of the patient, if possible, by change of air, ventilation, &c.; rectifying the primæ viæ, but studiously avoiding all mercurial medicines; carrying out the active local treatment suitable to this form of sore (*Principles*, 3d Am. Ed. p. 249); and administering internally the chlorate of potass—found to be a very appropriate alterative, in the dose of from one scruple to two scruples in the course of twelve hours. In the worst form, nourishment, tonics, and even stimuli may be imperiously demanded, to prevent sinking. And if the patient survive, the loss of substance will probably be such as can be remedied only by a determined autoplastic operation.

Cheiloplastics.

When the lip has been lost, either entirely, or in its greater part, in a patient otherwise of tolerable health, and not far advanced years, restoration by autoplasty may be contemplated. The part may have been destroyed by wound, sloughing, or intractable ulceration. In the last-mentioned case, we must be very careful not to attempt the engrafting of a substitute, until all ulcerative tendency has for some time wholly ceased—for very obvious reasons. After removal of truly cancerous disease, restorative interference is seldom expedient; unless by the peculiar arrangement of incision already spoken of (p. 194).

The autoplastic operation is conducted on the same principles as for restoration of the nose. A flap, of suitable form and dimensions, is brought from beneath the chin. A connecting slip is left at the symphysis; there gentle twisting is made, so as to bring integument to the surface; the part is secured in its new site by suture; and, by the like means, a portion of the submental wound is approximated—the rest being left to heal by granulation. After adhesion of the flap is completed, the mental slip of attachment is divided, and smoothed down, by the bistoury.

See Dieffenbach, &c., as in the foot-note of the former page. Liston's Practical Surgery. On Cancrum Oris, see Marshall Hall, Lancet, 1839–40, p. 409. Cycl. of Pract. Surgery, *sub voce*. Hunt, Med.-Chir. Trans. vol. xxvi. Also Lancet, No. 1023, p. 60.

CHAPTER X.

AFFECTIONS OF THE PALATE.

Congenital Deficiency.

EXTENSIVE deficiency of the *hard palate* is with difficulty remediable. Mitigation of the deformity and inconvenience may be effected by the dentist; a metallic plate being fitted into the chasm, on completion of the part's development. Also, something may be done by surgery; as recommended by Dr. J. M. Warren. The soft parts, having been carefully dissected off the bony arch, are brought together by suture, after the edges of the gap have been made raw. What filled the arch will probably meet readily on a plane surface; but should difficulty be experienced, farther relaxation may be obtained by dividing the anterior pillars of the soft velum.[1]

A mere fissure of the hard palate may disappear spontaneously, during the progressive development in adolescence. And if the mucous membrane should be slow in closing over, this process may be expedited by occasionally applying a heated wire, or by raising and approximating the raw edges.

The *soft palate* may be fissured, alone. Then, if the want of substance be not great, we have it in our power to attempt remedy by operation. Three circumstances, however, are essential, as preliminaries to the attempt. There must be no great deficiency, otherwise traction in approximation will be considerable, and adhesion will almost certainly fail. The patient must be of adult age, or nearly so; great steadiness and self-control being indispensable on his part, both during the operation and afterwards. The patient should also be of sound system, and in good health; so as to afford every possible facility to the occurrence of adhesion in the wound. And unless a concurrence of these circumstances can be obtained, the prudent surgeon will refrain from interference.

The operation is termed *Staphyloraphe*, or *Velosynthesis*. It consists of three distinct parts; preparation of the velum, paring of the edges, and approximation of the fissure by suture. The first part requires some considerable time for its completion. For weeks before the actual operation, the patient accustoms himself to open his mouth wide, and to retain it so, steadily and enduringly—with no effort at deglutition of saliva; and he also seeks to reduce the irritability of the parts, by

[1] New England Quarterly Journal of Medicine and Surgery, April, 1843.

frequently touching them with his finger, or otherwise. The nature of the operation is fully and candidly explained to him, and his willing co-operation secured. Then he is seated before a good light, with the mouth widely opened, and the edges of the fissure are made raw, by a narrow sharp-pointed bistoury, used as in harelip; a volsella being em-

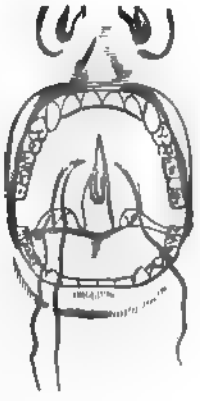
Fig. 83.

[Volsellum. (From Fergusson.)—Ed.]

ployed to seize the uvular extremity, and so to make the part tense during incision. This completes the second part of the operation. Some hours are now allowed to intervene; and it is well to give some simple nourishment at this time—it being obviously important to avoid the effort and movement of deglutition for some time after approximation has been effected.

The third part of the procedure consists in bringing the wound into accurate apposition at every point; diminishing the strain on the sutures, by lateral and parallel incision of the mucous membrane; and keeping the part in a state of as complete quietude as circumstances will possibly allow. Approximation is not made immediately after incision, because it is expedient to allow all oozing of blood to cease in the first instance; so as to avoid the irritation and involuntary movements of the palate, which its trickling does not fail to produce. But bleeding having wholly ceased, there is no necessity for farther delay. The necessary number of sutures are passed; and may be secured either by the ordinary knot, or by passing the oral ends through a soft metallic bead, running this up to the line of wound, and clasping it on the threads there by means of firmly-pointed forceps. Not a few instruments have been contrived for facilitating the sewing department in this operation—undoubtedly one of great difficulty; but it is probable that the curved needle in a fixed handle—as used for deligation of vascular tumors (*Principles*, 3d Am. Ed. p. 595, Fig. 209, *b*)—will be found quite suitable in experienced hands; or a short needle, very much curved, may be conveniently enough passed by means of a *porte-aiguille*.

Fig. 84.



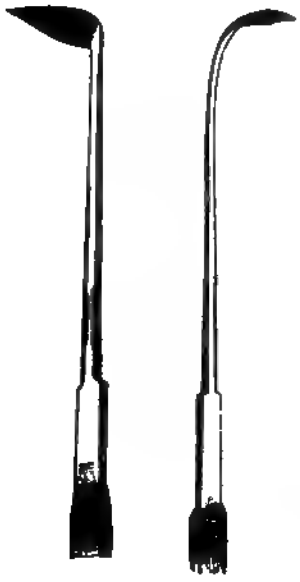
Plan of Staphyloraphe. The double ligature in the act of being drawn. The dotted lines mark the liberating incisions of the mucous membrane.

When approximation has been completed, a longitudinal incision is made on either side of the palate, through the anterior mucous membrane; so as, by permitting expansion at the cut part, to diminish traction on the line of union. Absolute starvation is not desirable. But

simple farinaceous food is sparingly and carefully administered from time to time; the patient being as passive as possible in the act of swallowing. And the ordinary constitutional treatment, favorable to the occurrence of adhesion, is of course rigidly enforced. Not a little self-denial is necessary, on the part of the patient, to avoid the oft-occurring excitements to coughing, hawking, and swallowing; compliance with which would have a manifestly unfavorable effect upon the wound.

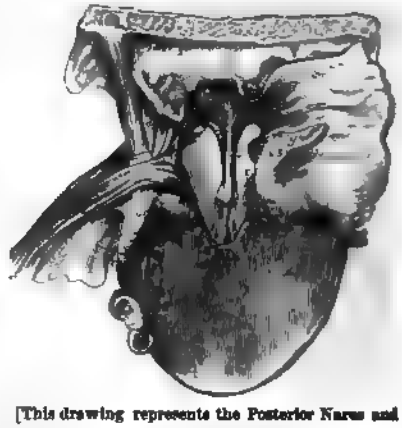
Mr. Fergusson has introduced a very ingenious modification of the ordinary operation; obtaining steadiness and quietude of the parts operated on by means of myotomy. Looking on a split palate, from the mouth, the parts are seen hanging quiet in the fauces, with a distinct central gap in the velum. If the flaps be touched, they will be raised upwards, by the action of the levatores palati muscles. If a stronger stimulus be applied, as by the rude touch of a finger, "each flap is forcibly drawn upwards and outwards, and can scarcely be distinguished from the rest of the parts forming the sides of the nostrils and throat;" and this is done by the action of the palato-pharyngei muscles, added to that of the levatores palati. On exciting the parts situated more posteriorly, "as in the second act of deglutition, the margins of the fissure are forced together, by the action of the superior constrictor muscle of the pharynx." The main opponents of approximation in staphyloraphe are thus shown to be the levatores palati and palato-pharyngei. And Mr. Fergusson's operation is planned so as to divide

Fig. 85. Fig. 86.



[Figs. 85, 86. Knives employed by Mr. Fergusson.—Ed.]

Fig. 87.



[This drawing represents the Posterior Nares and upper surface of the Soft Palate. *a*. The levator palati, the dark line shows where it should be cut across; the inner bundle of fibres of the palato-pharyngeus forming the posterior pillar of the fauces; the black line indicates the place for division. *c*. The palato-glossus with the place for incision, if one should be deemed necessary. The tonsil lies between these two muscles. *d*. The tensor palati, the cartilaginous extremity of the Eustachian tube is in front of this latter. *e*. The posterior extremity of the inferior turbinated bone. *f*. The septum. *gg*. The uvula on each side stretched apart. (From Fergusson.)—Ed.]

and temporarily paralyze these muscles. "With a knife, whose blade is somewhat like the point of a lancet, the cutting-edge being about a quarter of an inch in extent, and the flat surface being bent semicircularly, an incision is made about half an inch long, on each side of the posterior nares, a little above and parallel with the palatine flaps, and across a line straight downwards from the lower opening of the Eustachian tube. By this incision, placed about midway between the hard palate and the posterior margin of the soft flap, just above the thickest and most prominent part of the margin of the cleft, the levator palati muscle on each side is divided, just above its attachment to the palate. Next, the edges of the fissure are pared with a straight blunt-pointed bistoury, removing little more than the mucous membrane. Then, with a pair of long blunt-pointed curved scissors, the posterior pillar of the fauces is divided, immediately behind the tonsil; and, if it seems necessary, the anterior pillar is cut across too; the wound in each part being about a quarter of an inch in extent. Lastly, the stitches are introduced. . . . Or, it may be found more convenient to divide the palato-pharyngeus first, next the levator palati, and then to pare the edges when the muscular action has been taken off." When the pared edges look thin, it may be well to increase their breadth by applying the curved knife, so as to split the margins to a slight depth; so rendering the occurrence of satisfactory union more probable.

Ulcer and Exfoliation of the Palate.

The lining membrane of both the hard and soft palates is liable to ulceration, from ordinary or specific causes. The most intractable, and not least frequent examples, are those which are connected with the mercurio-syphilitic taint of system. · In such, constitutional treatment is all-important; the local applications varying, according to the characters of the sore.

Exfoliation of the hard palate, not unfrequently complicated with caries, and necessarily accompanied with ulceration of the corresponding mucous membrane, is seldom, if ever, found to occur, except when mercury has been freely administered. Again, treatment is mainly constitutional. Locally, separation is patiently awaited; and, when this has been completed, removal of the sequestrum is duly effected, if necessary. If the whole thickness of bone have perished, an aperture of communication necessarily results between the nasal and buccal cavities. If this be large, the deficiency can be supplied only by mechanical contrivance. If, however, it resemble a merely fistulous opening, closure of the mucous membrane may be obtained by the occasional application of a heated wire.

Med.-Chir. Transact. vol. xxviii. p. 291. Also, Fergusson's Pract. Surgery. For Dieffenbach's procedure in this operation, see his Operative Chirurgie, 1845, p. 856. [The reader will find very good papers on this subject of fissures of the hard and soft palate, by Dr. Mettaüer, Am. Journal, vol. xxi.; Dr. Mütter, ditto, vol. ii. N. S.; Dr. Warren, ditto, vols. vi. and xv. N. S.; Dr. Pancoast, ditto, vol. vi. N. S. Also, Smith's Operative Surgery.—Ed.]

CHAPTER XI.

AFFECTIONS OF THE TEETH.

It is unnecessary here to enter fully on the various and important topics connected with the subject of this chapter. A few leading surgical points may be stated; reference being made, on other matters, to the various separate works which treat of Dentistry in detail.

First, it is well that the student remember how affections of the teeth are connected not only with the convenience, comfort, and good looks of a patient—but with his health and very existence. The causes—sometimes remote, sometimes tolerably direct—of many affections implicating the general frame, as well as important parts of it, proceed entirely from the contents of the alveoli. Bad teeth "are frequently the cause—and the sole cause—of violent and continued headache; of glandular swellings in the neck, terminating in, or combined with abscess; of inflammation and enlargement of the tonsils, either chronic or acute; of ulcerations of the tongue or lips, often assuming a malignant action from continued irritation; of painful feelings in the face, tic douloureux, pains in the tongue, jaws, &c.;" of abscess and sinus of the cheek; of enlargement and change of structure in the gum, which may lead to dangerous tumor of the bone; "of disordered stomach, from affection of the nerves, or from imperfect mastication; and of continued constitutional irritation, which may give rise to serious constitutional disease."

Crowded Teeth

Are important in a surgical point of view. Behind, the irritation so caused may induce swelling, vascularity, and ulceration of the mucous membrane; probably with repeated attacks of troublesome and even dangerous cynanche. In front, crowded incisors are very apt to cause abscess; not confined to the soft parts, but implicating the bone also. The remedy is plain; early to prevent mischief, by removal of one or more of the redundant organs; or, at a later period, to retrieve disaster by the same procedure—removal of the cause.

Caries of the Teeth

Is the term usually employed to denote decay of the osseous matter; which usually commences on the surface, at one or more points, and proceeds inwardly until the pulp is exposed—the enamel also giving

way at an early period. When the disease is yet recent and limited, its progress may be arrested; by clearing away the disorganized substance, and "*stopping*" the cavity, either with gold or with cement. But after the pulp has been fairly exposed, and pain established, it may be stated, as a general rule—not to be rashly or often deviated from—that under such circumstances "stopping" is not advisable, and extraction of the offending part is highly expedient. Long to retain a decayed tooth, or portion of a tooth, in the hope of by various means quelling the pain of toothache, and so avoiding the pain of extraction, is to court the accession of some of the more important evils already enumerated as likely to spring from such a source of irritation.

Fig. 88.

Hopeless Destruction of the Tooth.

Toothache,

It is important to remember, may proceed from different causes; and so requires different treatment in different cases. It may be an example of neuralgia, with or without any connection with diseased teeth or gums, requiring the ordinary anti-neuralgic treatment, local and general (*Principles*, 8d Am. Ed. p. 587). It may be caused by caries of the tooth, advanced so as to expose the pulp; and then may be palliated by anodynes; temporarily arrested, painfully, by escharotics, or entirely quenched by extraction of the tooth; and the last, as already stated, is in most cases the preferable proceeding. It may arise from inflammatory action in or around the tooth—in the interior of the tooth's cavity, or in the alveolar investing parts—not necessarily connected with decay of the tooth at any part; and this form is plainly to be assuaged by antiphlogistics, local and general; locally, leeches and fomentation to the gum; constitutionally, purgatives, antimony, and low diet; the patient at the same time affording as much rest as possible to the affected part, especially avoiding all irritation of it by tongue, finger, or toothpick. Also, severe pain may be felt in the teeth, apparently sound, quite of a rheumatic origin and character; and this is to be got rid of by anti-rheumatic remedies, mainly constitutional in their operation. Change of structure in the fang of the tooth—it becoming coated by rough osseous deposit—may induce intense pain, though the organ be in other respects sound; by such hypertrophy, it is probable, the nerves are incommoded and compressed; and the only remedy is extraction. And, lastly, the fang or fangs, of a tooth may become necrosed, the crown and cervix remaining apparently sound; chronic abscess forms around the affected part, the matter accumulating in a distinct membranous pouch; and much pain is likely to be thus occasioned, until either the tooth is extracted, or becomes loose and permits spontaneous evacuation and discharge.

Fig. 89.

Purulent Cyst at the fang of a decayed Tooth; often the simple origin of most serious mischief.

Extraction of Teeth.

Extraction of a tooth is demanded, not unfrequently, of the surgeon, as an operation of itself; or as a means towards the cure of another,

Fig. 90.

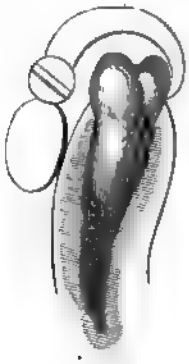


Fig. 90. Diagram showing the application of the tooth-key.

Fig. 91.

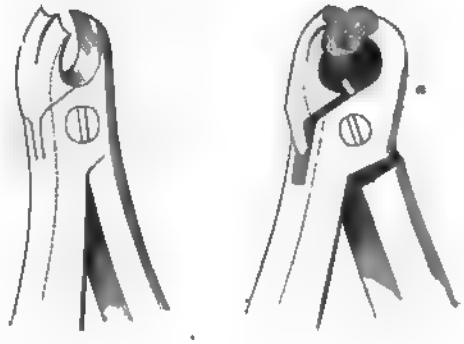
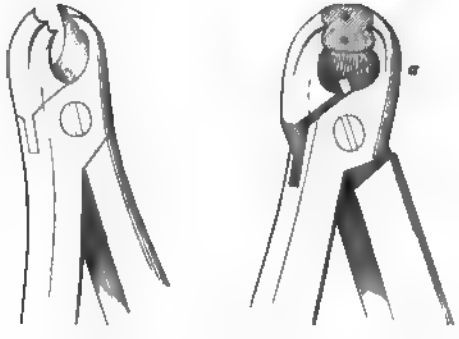


Fig. 91. Forceps for the upper jaw; constructed so as to adapt themselves closely to the form of the tooth. In *a*, the tooth, sawn across, shown embraced.

and, perhaps, distant affection—such as neuralgia; or as part of a more serious operative procedure—as in extirpation of a portion of the jaw.

Fig. 92.



Forceps for the Lower Jaw. In *a*, the tooth embraced.

Forceps and the tooth-key are the instruments usually employed. The former, in general estimation, is by much the preferable; equally certain to effect the object in view, and possessing the great recommendation of exerting all the force on the doomed part, and leaving the alveolus and gum comparatively, or absolutely, uninjured. Practice is, no doubt, essential to the skilful and efficient use of forceps; and many instruments are required in the well-equipped armamentarium, adapted to the configuration and lodgement of the tooth to be removed.

Stumps are removed either by means of sharp forceps, introduced beneath the gum; or by a lever passed between the offending part and its alveolus, making use of a neighboring sound tooth, if possible, as a fulcrum.

Hemorrhage after Extraction.

Troublesome bleeding may follow the ordinary extraction of a tooth, and may proceed from one of two causes. An arterial branch, of some size and activity, may have been implicated in the injury inflicted on the alveolus. Or the patient may be one of those unfortunates afflicted with the hemorrhagic diathesis. The former case is usually manageable enough. The cavity is sponged dry, and an escharotic applied—nitrate of silver, probably the preferable—so as temporarily to arrest the flow, and afford a dry bed for the compress. Then, with all convenient speed, strips of lint, steeped in a strong tincture of matico, are inserted firmly into the cavity, by means of a stout probe or director; and the jaws, having been brought together with a compress interposed at the injured part, are made to exert and maintain a sufficiency of pressure on the bleeding point. In the other case, the same local treatment is advisable, with the means suitable to the hemorrhagic diathesis (*Principles*, 3d Am. Ed. p. 360).

Tartar on the Teeth.

Accumulation of salivary deposit is to be prevented, for obvious reasons; its presence being prejudicial to the teeth themselves, to the gums, to the mucous membrane of the cheek and lips, and to the tongue. The teeth are apt to loosen and decay, the gums to become congested, the mucous membrane to become the seat of obstinate and painful ulceration. In effecting removal, care must be taken to leave the enamel uninjured.

Recession of the Gums.

In advanced years, and sometimes even in middle age, the gums recede from the cervices of the teeth, especially in front, exposing the fangs; occasioning looseness, pain, irritation, and final decadence; though, in other respects, the organs may be quite entire. In the senile cases, but little can be done by remedial treatment; the occurrence is only a part of the general decay, and is, in all respects, to be regarded as such. A similar result may follow the accumulation of tartar; it is to be averted by removal of the offending matter. Congestion of the gums may induce it; and this cause is met by local abstraction of blood, by leeches or scarification, and by the subsequent use of astringent dentifrices. At the same time it is very necessary to look to the state of the primæ viæ, and to correct the irregularities which will probably be found there.

Injuries of the Teeth.

A tooth struck smartly may be deprived of a part of its compact structure, without any serious injury to the integrity of the rest. If, however, it have been displaced, and its vascular connection broken up, necrosis is the result. Sometimes simple dislocation occurs, without fracture.

By replacing a dislocated tooth, an imperfect union with the alveolus may take place; but the tooth will eventually lose its color, and induce an unhealthy action in the gums.

C. Delabarre, Traité de la Seconde Dentition, Paris, 1819. F. Maury, Traité Complète de l'Art du Dentiste, Paris, 1833. Thomas Bell, Anatomy and Physiology of the Teeth, London, 1835. William Robertson, Practical Treatise on the Human Teeth, London, 1839. Chitty Clendon, On Extraction of the Teeth, London, 1844. Goddard and Parker, Anatomy, Physiology, and Pathology of Human Teeth, Philadelphia, 1844. John Tomes, Lectures on Dental Physiology and Surgery, London, 1848. Chapin Harris, Principles and Practice of Dental Surgery, Philadelphia, 1850.

CHAPTER XII.

AFFECTIONS OF THE JAWS.

Parulis.

The term Parulis denotes the condition of *Gumboil;* inflammation of the gum, usually connected with a decayed tooth or portion of a tooth. The swelling causes much pain and discomfort, sometimes with smart constitutional disturbance. On suppuration taking place, relief is obtained by evacuation of the matter; but so long as the decayed tooth remains, a certain discharge, with swelling and pain, continues to prove the source of no slight annoyance. Treatment varies according to the stage of advancement. At first, the affection just originating, the decayed tooth should be removed at once, and bleeding from the wound encouraged; and afterwards, if need be, blood may be farther withdrawn by leeching the affected part—the animals being most conveniently applied through a glass tube. When matter has formed, it should be early and fully evacuated; and after the excitement following incision has abated, under ordinary antiphlogistic means, the offending tooth or stump should be gently extracted. To perform extraction earlier, might be to aggravate the inflammatory action unnecessarily.

When the matter has formed and been discharged, extraction of the tooth will ordinarily suffice for effecting contraction and closure of the discharging aperture, with subsidence of the swelling and pain. If not, some of the many suitable astringent solutions may be applied to the part.

Epulis.

Epulis denotes a solid tumor of the gum, of non-inflammatory origin; but, like parulis, often, if not usually, connected with the presence of a decayed tooth, or portion of alveolus. It may be either simple or malignant. The simple form is a sarcomatous growth, at first seated in the soft parts of the gum, but tending soon to involve the subjacent bone; in short, the tumor, at what may be termed its period of maturity, may be truly considered an example of osteosarcoma, on a small scale. It spreads slowly. Teeth loosen, and are surrounded by the fleshy growth; and the body of the bone becomes more and more involved.

In the early condition, it is sufficient to remove the offending tooth, or piece of bone, and, with a bistoury, to excise the altered portion of gum, repressing subsequent tendency to growth, if need be, by the application of an escharotic. When the bone has become involved, it is essential that the affected portion shall be taken away, early and freely, for obvious reasons, and this is readily effected by knife, saw, and cutting pliers (*Principles*, 3d Am. Ed. p. 458).

The malignant form is, fortunately, by much the more rare. Very early the bone is affected, and the tumor is a true specimen of osteocephaloma. Soon the surface ulcerates and fungates, with bloody loathsome discharge, and the spread is rapid in all directions. Obviously, the only remedy is by ablation, and that at a comparatively early period.

Sometimes, malignant disease commences in the upper jaw, not with the formation of tumor, but at once by ulceration, *osteocancer* (*Principles*, 3d Am. Ed. p. 460). The loss of substance speedily wastes the alveoli, and, opening into the antrum, discloses a foul and hideous sore, at a very early period beyond the reach of the most active surgery.

Tumors of the Lower Jaw.

The lower jaw, like the upper, is liable to be the seat of a chronic collection of fluid, here usually termed *Spina ventosa*, as well as to be occupied by both osteosarcoma and osteocephaloma.

Spina ventosa of the lower jaw, as formerly explained (*Principles*, 3d Am. Ed. p. 408), is an example of *osteocystoma*. The remedy is by puncture and evacuation, gradual contraction and consolidation of the cavity being sought for, by pressure from without, and by maintaining a certain amount of inflammatory action within, as by a seton, or stimulant injections.

Fig. 98.

Cyst at the root of a decayed Tooth, lined by secreting membrane, and filled with puriform fluid, chronic. Supposed to be the origin, in many cases, of osteocystoma.

The solid tumors require the same treatment as in the upper jaw. But, with this difference, that in consequence of the relative anatomy of the parts, complete ablation of an osteocephaloma is within our power at a much more advanced period, than in the case of the superior maxilla, inasmuch as the whole diseased structure can be included in the incisions, and taken away.

The simple *Osteoma* (*Principles*, 3d Am. Ed. p. 452) has occurred in the lower jaw. At first, to be treated by attempts at arrest of growth, and subsequent discussion; this failing, ablation of the affected part is to be had recourse to, for even this simple structure has been known to degenerate.

Fig. 94.

Fig. 94. Osteosarcoma of Lower Jaw. Hard, smooth, non-ulcerating; slow in growth.

Fig. 95.

Fig. 95. Osteocephaloma, contrasted with the preceding. Soft, fungous, ulcerous, rapidly enlarging, and involving all textures.

Extirpation of the Lower Jaw.

Amputation of the whole bone has been practised, on account of tumor, but with such a result as scarcely to warrant repetition of the operation. The dangers to life are many and almost insuperable. Besides those by loss of blood, and constitutional shock, there is an immediate risk of suffocation by the uncontrolled condition of the tongue and fauces. Inflammatory action, causing œdema, is, at a more advanced period, certain to cause laryngeal obstruction, threatening asphyxia. And, supposing these dangers past, another remains, by bronchitic or pneumonic seizure, cold air being at once and constantly admitted to the larynx; whereas, for a long time previously, atmospheric access had been by a most circuitous and gradual route, in consequence of the presence of the large obstructing tumor.

Fig. 96.

Osteosarcoma of the Lower Jaw, supervening on osteocystoma. (Liston *Vide* Elements, p. 420.)

Partial removal of the lower jaw is a very feasible operation; and, as formerly stated, when undertaken on account of genuine osteosarcoma, is seldom followed but by a fortunate issue.

Not unfrequently the jaw is so occupied by the tumor, as to render removal of the entire half necessary; by disarticulation, and division at or near the symphysis. An incision is begun opposite the articulation, and continued downwards and forwards, along the posterior and inferior borders of the bone, first on its ramus and then on the body. Opposite to where it is intended to saw the bone in front, the forward

course of the knife is arrested, and the instrument is directed upwards to divide the lip—leaving, however, the prolabial portion entire. The flap, thus indicated, is dissected upwards; including all the soft parts, and fully exposing the tumor. Then the anterior portion of the bone, where section is to be made—wide of the tumor—is fully cleared of soft parts, on every aspect; a tooth, if necessary, is extracted; the external surface is notched by Hey's saw, and section is completed by stout cutting-pliers. Now the internal attachments of the tumor and implicated bone are divided by the bistoury. And as the articulation is approached, the anterior portion of the bone is depressed by the operator's left hand, so as to facilitate disarticulation; yet avoiding such an amount of pressure as may occasion fracture of the altered structure. Depression being made by the surgeon, and an assistant now compressing the common carotid, the muscular attachments to the coronoid process are cut across, and afterwards disarticulation is effected; this part of the operation being completed as rapidly as possible, from before backwards, opening the joint in front, and with the knife's point moving closely to the bone, so as to avoid an unnecessary loss of blood. The bleeding vessels are then tied at the upper angle of the wound, either singly, or by deligation of the common trunk of the temporal and internal maxillary arteries—which may happen to be exposed—by means of an aneurism needle. The facial, temporarily commanded by the fingers of an assistant, is last secured. And then the flap is replaced, and retained by suture; the entireness of the prolabium in front obviously contributing much to the facility of accurate adjustment. The wound, in its major part, is likely to heal by adhesion; a portion suppurates and gapes, not inopportunely, to permit suitable discharge of the purulent secretion from within. Dressing of the interior is conducted as in the case of the upper jaw; and consolidation, with reparation, in like manner results. During the process of cure, material benefit will sometimes accrue from the use of a mechanical contrivance, adapted to the teeth, whereby overlapping and displacement of the mutilated part is prevented. "Metallic caps are fitted to the teeth of the upper and lower jaws of the sound side, and are riveted and soldered together at their bases, so that, when applied, they shall have the effect of preventing the dragging of the remaining portion of the bone and chin to the opposite side by the external pterygoid, mylo-hyoid, and digastric muscles, and by the elasticity of the soft parts. This apparatus should be worn for many weeks after the operation."[1] Contrivances may also be temporarily worn, on the injured side, to prevent undue shrinking of the cheek during granulation.

A tumor implicating the body of the bone only, on one side, may be removed by a similar but less extensive incision; section of the bone being made at the angle and symphysis. But the propriety of such a proceeding is very questionable. Experience has shown that, in such cases, return of the disease is very apt to take place in the truncated ramus; and when this happens, difficulty of disarticulation is found to be great, from want of power in depressing the coronoid process, and

[1] Liston's Practical Surgery, p. 318.

consequently in dividing the insertion of the temporal muscle. It is expedient, therefore, in all such cases, to anticipate return of the tumor, and the difficulties of a second operation, by at once performing disarticulation. Besides, this is a principle of operation quite analogous to what determines excision of a long bone, affected by tumor, rather than its partial removal; preferring, for example, amputation at the shoulder-joint to an operation with section of the bone, on account of tumor of the humerus (*Principles*, 3d Am. Ed. p. 457).

Sometimes, though rarely, osteosarcoma originates in the ramus. Then it is necessary to effect disarticulation, after performing section at or near the angle of the bone. In such a case, it is expedient to grasp the ramus, after section, by means of firm and sharp-pointed forceps, so that the requisite lever-power may be obtained for depression. Also, it may be possible to effect this operation, without opening the cavity of the mouth.[1]

The symphysis may be removed on account of tumor; a horizontal wound being made along the lower border of the bone, with a perpendicular incision at each extremity, leaving the prolabial surface entire. Section of the bone is made partly by the saw, partly by cutting-pliers; the requisite teeth having been previously extracted. After excision has been effected, some care of the tongue is necessary; lest, after division of its anterior attachments, it should be unduly retracted, and threaten asphyxia. To obviate this, the organ may be temporarily restrained, either by ligature or by forceps.

Sometimes it is necessary to remove the symphysis along with one half of the jaw, the tumor being so extensive. This is effected by such a form of incision as recommended for disarticulation with section at the symphysis.

Sometimes it is expedient to remove a portion of the jaw, on account of ulcer or tumor of the soft parts, which has implicated the osseous tissue secondarily. One paramount indication must in all cases be fulfilled; to remove the whole of the morbid structure, and to cut wide of the disease.

[Dupuytren has generally received the credit of having first performed *partial* extirpation of the lower jaw; but the honor of the operation unquestionably belongs to Dr. Deadrick, of Tennessee; Dr. Deadrick operated in 1810, and Dupuytren in 1812. Since then, the operation has been often repeated, Velpeau enumerating about 160 cases, of which 40 terminated fatally. The *entire* lower jaw has been removed several times, recently by Dr. Carnochan, of New York.[2]

In the *American Journal of Medical Science*, vol. vii. 1831, Dr. Barton published an account of an operation by which he excised a large part of the lower jaw, extending on each side of the symphysis, without removing the base of the bone, thus leaving the attachments of the tongue and muscles of the neck untouched. The patient had a very

[1] Syme, London and Edinburgh Medical Journal, 1843, p. 964.

[2] American Medical Recorder, July, 1823; South's translation of Chelius, Am. Ed. vol. iii.; Carnochan, New York Journal of Medicine, January, 1852, and May, 1852; Blackman, ibid. February, 1852; Smith's Operative Surgery; Velpeau, Operative Surgery, Am. Ed. vol. ii.

large tumor, which filled the cavity of the mouth, separated the jaws, and formed a large swelling on their exterior. In a month after the operation the man was well, and able to masticate his food with the remaining molars. (See *Smith's Operative Surgery.*) In the last edition of his *Practical Surgery* (Am. Reprint, 1853), Mr. Fergusson describes a similar operation successfully performed by himself, since Dr. Barton's.

The importance of saving the base of the jaw, if possible, is very evident.

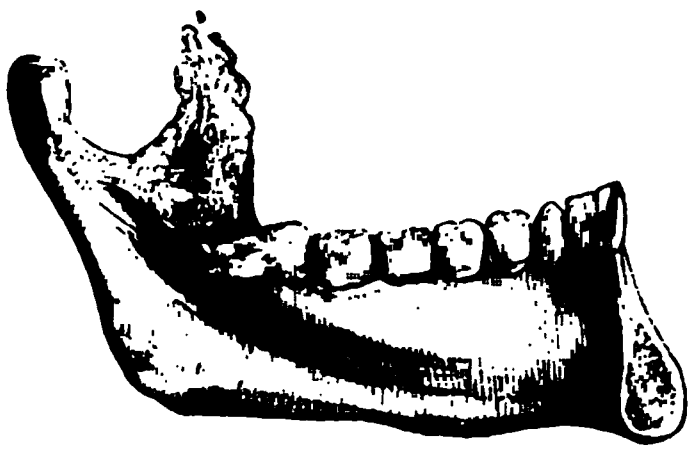
In these operations upon the lower jaw, the surgeon should bear in mind the importance of avoiding *the duct of Steno* and *the facial nerve.* In a case in which Dr. Mussey, of Cincinnati, was obliged to remove the left half of the jaw, he accomplished the operation without dividing the above-mentioned organs, by commencing his incision of the integuments below the point of their transit, and by dissecting the soft parts from the bone, in the process of disarticulating and separating the latter, as closely as possible. By this means, the symmetry of the mouth was perfectly preserved; and, after an artificial jaw was adapted to the side operated on, the beauty of the lady's face was but little marred. (*Trans. of the Am. Med. Association*, vol. iii. p. 364).—Ed.]

During these operations on the mouth, it is plain, for reasons formerly assigned, that chloroform, if employed at all, must be used warily (p. 182).

Caries and Necrosis of the Lower Jaw.

The lower jaw is liable, like other bones, to these common affections. But, in the present day, it suffers much less frequently and extensively in this way, than it did when mercurialization was more in vogue for venereal affections—real and suspected. Many teeth, large portions of the jaw, and even the greater part of the entire bone, not unfrequently were tediously and painfully discharged, as worm-eaten sequestra; causing much disturbance, both local and general, at the time, and great subsequent deformity. When either of these affections do occur, the general principles of surgery are brought to bear on them; by treatment partly local, partly directed to the system.

Fig. 97.



Ulcerative destruction of the Coronoid Process of the Lower Jaw, caused by "the awkward position of the wisdom tooth." The patient "perished in consequence of the extensive abscesses of the mouth and neck." (Liston.)

Necrosis of the jaws, from the agency of phosphorous acid generated in the manufacture of lucifer matches, has been already alluded to (*Principles*, 3d Am. Ed. p. 421).[1]

Fracture of the Lower Jaw.

The lower jaw may be broken by violence applied either directly or indirectly. Fracture near the middle of the body of the bone may be

[1] *Vide* also Lancet, No. 1367, p. 498.

the result either of a blow delivered on the symphysis, or of injury directly sustained by the part fractured. The body of the bone is most frequently injured, but all parts are liable. The ramus has been fissured, the condyle has been broken off, the coronoid process has been snapped through, and the symphysis itself has given way. The fracture may be either simple or compound. Almost always, there is laceration of the mucous membrane, with consequent hemorrhage into the mouth, and exposure of the fractured ends in that direction. The signs of the occurrence are sufficiently plain; by deformity, crepitus, loss of power, and evident displacement. The mental portion is usually displaced downwards, by muscular action.

Reduction is easily effected; and, usually, retention is not difficult. Supposing the fracture to be at its ordinary site, near the middle of the body of the bone, the fragments are carefully adjusted, with the teeth in a line; and two wedges of cork, sloping gently backwards, with their upper and under surfaces grooved for the reception of the upper and lower teeth, are inserted on each side of the mouth; the jaws having been firmly closed on them, a pasteboard splint is adapted to the exterior surface; and the whole is retained by suitable bandaging. The object of the wedges is twofold, and obviously beneficial; namely, to secure accurate apposition of the fragments, and to leave a vacant space in front, suitable for the passage of fluid nourishment without movement of the parts. The objection to their use is, that, as foreign bodies, they may cause salivation or other inconvenience; if this should happen, they can readily be removed; and meanwhile, by their temporary presence, considerable benefit may have been obtained. Sometimes, if firm teeth occupy the verge of each fractured portion, it may be well to secure these in apposition by silk ligature. Teeth quite detached should be removed at once; and so ought fragments of bone, similarly circumstanced—in cases of comminution. For some time, the patient must be content with such articles of food as require no mastication; and all movement of the fractured part must be avoided.

Fig. 98.

Four-tailed Bandage, applied to secure the lower jaw.

Dislocation of the Lower Jaw.

Dislocation of the jaw is forwards; the condyles in front of the base of the zygomatic process, and the coronoid processes resting on the edge of the malar bone.[1] The accident may be complete or partial; according as one or both condyles are displaced. And it may be the

[1] Nelaton, Mémoires de la Société de Chirurgie de Paris, 1849.

result of mere muscular action, as in yawning; or of force applied to the symphysis, with the mouth more or less open. The mouth gapes, and cannot be shut; the chin is depressed, and saliva trickles over it; the condyloid space is vacant, and prominence is felt beneath the zygomatic process; considerable pain is experienced, and articulation is very indistinct—perhaps altogether obstructed.

Reduction is effected by a combined movement; depression of the angle, elevation of the symphysis, backward pressure on the coronoid processes, and traction forwards of the whole bone. Thus the bone is extricated from its entanglement; and, brought within the uncontrolled play of the muscles, is by them pulled back into its normal position. The thumbs placed over the last grinders, within the mouth, effect the first movement; the rest of the hand makes the extension, with elevation of the symphysis; and an assistant presses back the coronoid processes from their rest on the cheek bone. It is not necessary to protect the thumbs, by a towel or otherwise. As the jaw is felt to yield, they are made to slide on to the alveoli on the outer side; and the snap, which accompanies and denotes replacement, finds nothing interposed between the teeth. For some days afterwards, the motions of the jaw should be very limited; and in most cases it is well to restrain them by a bandage.

Anchylosis of the Jaw.

This may be spurious or real (*Principles*, 3d Am. Ed. p. 503);, the result of change in the soft parts or in the hard. Mastication, deglutition, and speech are seriously interfered with; and the patient anxiously seeks relief. This may be afforded by the knife alone, when cicatrices are in fault; dividing adhesions, and preventing reunion by careful dressing subsequently. Sometimes, in addition, subcutaneous section of the masseter is advisable.[1] When rigidity is extreme, and depends on true anchylosis, it may be necessary to operate on the jaw itself, in order to prevent death from inanition; sawing the bone through, so as to make a false joint; or removing a central portion entirely, for the admission of food.

[The operation will be very much facilitated, either with or without previous division of the muscles and adventitious bands, by the employment of mechanical means for separating the jaws. For this purpose the lever of Heister, a similar instrument contrived by Dr. Mott, or the screw dilator of Dr. Barton, will be found available. The instrument of Dr. Mott is represented in the 3d vol. p. 1142, of his edition of *Velpeau's Operative Surgery*, where also the reader will find detailed remarks concerning anchylosis of the jaw; the dilator of Dr. Barton is figured in *Smith's Operative Surgery*, where, in like manner, operations for the relief of the difficulty are described and illustrated.—Ed.]

On removal of the jaw, see Koecker on Diseases of the Jaws, &c. London, 1828. Boyer, Mémoire sur l'Amputation de l'os maxillaire inférieur, in Journal Complém. du Dict. des Sciences Médicales. Dupuytren, Leçons Orales. Mott, American Medical Recorder, vol. i. Cusack, Dublin Hospital Reports, vol. iv.

---

[1] Fergusson, Practical Surgery.

CHAPTER XIII.

AFFECTIONS OF THE TONGUE.

Glossitis.

The inflammatory process in the tongue may be variously induced; by wounds, stings, or other injuries; by ptyalism; by acrid applications. Or it may occur spontaneously. The symptoms are—pain, swelling, salivation, intense thirst, impairment of the ordinary functions of the organ. In extreme cases, the swelling may occlude the fauces, and threaten asphyxia.

The treatment is by abstraction or counteraction of the cause; leeches to the part, or the opening of a ranine vein; and the ordinary antiphlogistics internally. In cases of urgency, we need not hesitate to make longitudinal incisions, freely, as if for phlegmonous erysipelas; the escape of blood is copious, the exuded fluids also find a ready exit, usually the swelling rapidly abates, and the wounds, which at first were gaping and deep, dwindle down to mere scarifications. The antiphlogistic result is satisfactory, and no important lesion of structure is inflicted on the part. Should a case present itself too advanced to admit of waiting for the effects of incision, life must be saved at all hazards—by bronchotomy.

Fig. 99.

Tongue, swollen by Glossitis.

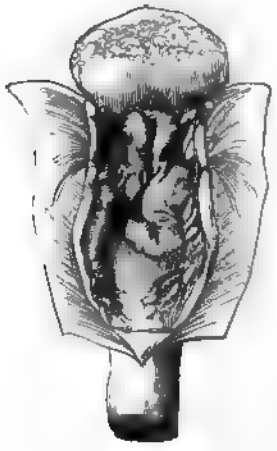
Wounds of the Tongue.

Wounds of the tongue bleed copiously. Hemorrhage is to be commanded by ligature and styptics; if need be, the cautery may be applied. In uniting the wound, after bleeding has ceased, it is plain that we can avail ourselves only of the common interrupted suture—other retentive means being inapplicable to the part. In the slighter cases, the use of sutures may effect not only approximation but also a hemostatic result.

Ulcers of the Tongue.

Ulcers of the tongue, like those of the lips, may be either simple or malignant. The former may depend on local irritation, as from tartar or decayed teeth; or on gastric irritation; or on a general febrile con-

Fig. 100.



Excavated Malignant Ulcer of the Root of the Tongue. Œdema glottidis has supervened secondarily.

dition; or on a mercurio-syphilitic state of system. And the treatment, it is obvious, will vary accordingly. The preferable local applications are—nitrate of silver, either in substance or in solution; and, in obstinate cases, the fluid pernitrate of mercury; the former applied frequently, the latter at long intervals.

The malignant ulcers are to be got rid of, by knife, ligature, or cautery. The first two methods are usually to be preferred; and due care must ever be taken that the whole of the apparently diseased part, with a border of apparently sound texture, is removed (*Principles*, 3d Am. Ed. p. 317).

Persons of advanced years should be very careful to avoid all continued irritation of the tongue, as by tartar, false teeth, &c., lest troublesome and ultimately malignant ulceration be induced.

Hypertrophy of the Tongue.

The tongue is occasionally the seat of simple enlargement—congenital or acquired. The normal texture is gradually expanded and the papillæ become greatly enlarged. Much inconvenience necessarily results, even though, as usually happens, the jaw, in some proportion, accommodates itself to the altered interior. Ultimately, the tongue protrudes, and a wasting discharge of saliva necessarily results. Deglutition, articulation, and even breathing are more or less interfered with.

The treatment is by rectification of the primæ viæ, usually very prominently disordered, by repeated leeching of the part, and by internal administration of the iodide of potassium. Should such means fail, it may be expedient to remove a portion at the apex, of a wedge shape, and of such a size as to restore the organ to something like its normal bulk, on approximation of the wound's edges, at least rendering the organ capable of residence within the mouth, so removing the principal deformity and inconvenience—protrusion, and reducing the risk of excessive inflammation in the wound.

Induration of the Tongue.

The tongue, instead of undergoing a general hypertrophy, may be affected by partial enlargement, certain portions becoming elevated, hard, and painful, being the seat of a chronic inflammatory process of low grade. The swellings may remain of an indolent nature, slowly enlarging, or altogether stationary. Or they may slowly suppurate; the matter imperfectly discharging itself by a ragged and somewhat

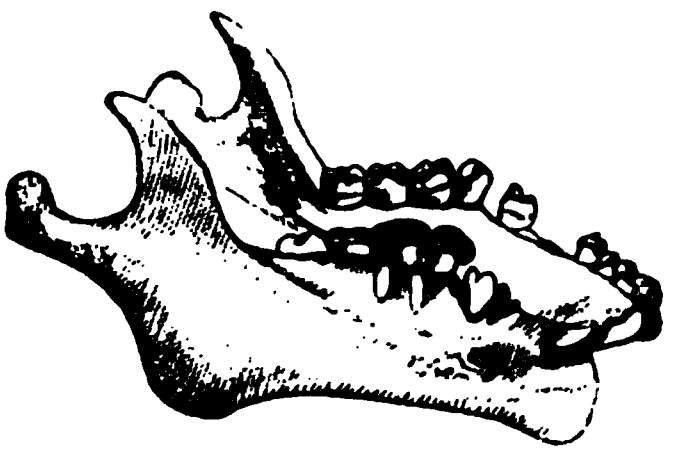
sinuous aperture; the general appearance of the part closely simulating malignant disease.

The treatment is as for hypertrophy, by leeching, alteratives, and attention to the primæ viæ. In many cases, the internal use of arsenic has been found of signal benefit. And, when sarsaparilla, iodide of potassium, arsenic, fail, a cautious course of mercury may be administered. The combination in Donovan's liquor often proves useful. The unhealthy cavities made by suppuration are to be exposed by potass, freely applied; and then sound cicatrization may be expected.

Erectile Tumor of the Tongue.

The erectile tumor may form in this organ. A few examples are on record. If the diseased structure be limited and accessible, it is to be removed by inclusion in ligature. If it involve the whole organ, or be otherwise not amenable to deligation, attempts may be made to induce a remedial change of structure, either by ulceration or by plastic exudation (*Principles*, 3d Am. Ed. p. 563). Failing this, the disease must be regarded as beyond the reach of our art. Deligation of both lingual arteries has been practised, but with a result which does not invite repetition; fatal sloughing of the organ ensued.[1]

Fig. 101.



Expansion of the Lower Jaw; the result of pressure by the tongue, enlarged by erectile tissue. (Liston. *Vide* his *Elements of Surgery*, p. 410.)

Removal of Portions of the Tongue.

On account of malignant disease, occult, or open, as well as on account of erectile tumor, it may be necessary to remove a part of the tongue. Malignant disease, involving the whole organ, may be regarded as irremediable.

Carcinoma and Cancer show their ordinary characteristics here, and follow their usual course. A detailed statement of the symptoms and progress of such affections is therefore unnecessary (*Principles*, 3d Am. Ed. pp. 310, 313).

Removal may be effected either by knife or by ligature. The former is employed when the doomed part is situate anteriorly, and not extensive; hemorrhage, under such circumstances, being readily under control. By a volsella, the part is seized, stretched, and made to project outwardly; and by a bistoury satisfactory ablation is leisurely and carefully effected. Hemorrhage having been arrested, the wound is approximated by suture, if its size and form permit.

In other cases the ligature is preferred. A stout cord is passed on the proximal aspect of the diseased part, in sound texture, by means of a large needle in a fixed handle, as recommended for erectile tumors

[1] Liston's Elements of Surgery, p. 409.

(*Principles*, 3d Am. Ed. p. 562); the noose of the ligature having been divided, each half is drawn tight separately, so as completely to isolate and strangulate the diseased portion; and it is well to notch with a knife the line of constriction, previously, so that strangulation may be at once complete. By whatever mode removal is effected, the prognosis must be but gloomy; for it can be readily understood, that return of malignant disease is but too probable, in an organ which has been only in part taken away.

Sometimes it may be warrantable, even in avowedly hopeless circumstances, to remove a malignant ulcer of the tongue by operation, solely with the view of palliation (*Principles*, 3d Am. Ed. p. 319).[1]

Division of the Frænum.

In the child, the frænum linguæ may be so short as greatly to incommode the organ; at first impeding suction, afterwards embarrassing articulation. Or the defect may be more accurately expressed, perhaps, as an abnormal prolongation forwards of the frænum, tying down the apex of the tongue. The faulty texture is readily divided, by means of probe-pointed scissors—the point of the tongue being elevated, so as to stretch the part, by the finger, or by means of a split card; and, cutting rather on the jaw than on the tongue, troublesome bleeding by wound of the ranine vessels is avoided. During healing, the tongue should be exercised so as to prevent recontraction.

In the adult, a somewhat similar condition may supervene, in consequence of troublesome suppuration beneath the tongue. During cicatrization, the apex of the organ is drawn down, and becomes confined by a dense band of adventitious formation. This spurious frænum may be dissected through; and, by dint of careful dressing, a more favorable cicatrix may be obtained.

Ranula.

Ranula denotes a tumor, formed beneath the tongue, in consequence of obstruction in one or both of the salivary ducts. It consists of a cyst, produced by expansion of the duct, and condensation of the surrounding parts; and of clear contents—perverted secretion of the cyst, and of the corresponding salivary gland. Inconvenience is felt in mastication, deglutition, and articulation; indeed, the term ranula has been applied on account of the croaking change of voice. The tumor is distinctly seen on elevating the apex of the tongue; and but slight manipulation is necessary to ascertain its cystic and salivary nature.

[There is no doubt that the tumors to which the term *Ranula* is applied, are in some instances formed by the dilation of the ducts of the sublingual, and less frequently of the submaxillary gland, caused by obstruction from salivary calculi, or from inflammatory exudations.[2] In most cases of this kind, the formation of the tumor takes place

[1] See also Bennett on Cancerous and Cancroid Growths, p. 129.
[2] See Abeille, Traité des Hydropisies et des Kystes, p. 501.

gradually; sometimes, however, after having attained a certain size, a sudden increase of volume occurs in consequence of rupture of the distended duct, and the contents of the swelling are thrown into the loose cellular tissue exterior to it.

But in many, and probably in most cases, the pathology of ranula is different. This is evident from many circumstances. 1. The size to which the tumor not unfrequently arrives is so large as to render its origin from distension of a duct, so small as that of the excretory ducts, exceedingly improbable. Thus Petit saw a ranula, which was three times as large as a hen's egg; it displaced the genio-glossus and genio-hyoid muscles, and formed an enormous tumor between the chin and the hyoid bone. Clerc describes one from which he evacuated a pound of fluid; Wilmer removed 12 ounces from another. Boinet operated upon one which threatened the patient with suffocation; it filled the whole buccal cavity, and projected half its volume out of the mouth; the teeth had impressed themselves deeply into its substance. Malcolmson describes one which surrounded the front of the neck, and extended downwards to the chest.[1] 2. In many cases of ranula, the ducts have been found perfectly pervious when examined with a probe, and free from any calculous concretion after death; and even when such concretions existed, it by no means follows that they obstructed the ducts, or that they produced the swelling—for similar concretions are not at all rare in ordinary cysts.[2] 3. If the tumor were due to the cause stated in the text, its contents would be uniformly similar to, or identical with, the saliva, or its component elements would resemble those of the latter. But the fluid found in ranula is very variable in consistence, color, and microscopical ingredients. It is, moreover, entirely different from saliva in chemical composition, containing no sulphocyanates, and but a trace of salivin, but chiefly albumen.[3] The character of the fluid has also been carefully investigated by Besanez; he found in it water, traces of fat and chloride of sodium, aqueous extractive matter, and albuminate of soda; under the microscope, blood-corpuscles and inflammatory exudation corpuscles, but none of the ordinary characters of saliva.[4] 4. If incision be practised upon an excretory duct, it remains fistulous; whereas, if ranula be thus treated, the sac closes by granulation; hence the success of this mode of treatment as recommended by many surgeons.[5] 5. The sac constituting the tumor has been removed by dissection, and found to have no connection with the ducts of the gland.[6] 6. The cyst in ranula is often *multilocular*, of which Dupuytren gives an example (*Clinique*, tom. iii. p. 318); a condition which is much more readily explained upon the supposition that it is a cyst of new formation than upon any other. Like other true cystic tumors, ranula is not unfrequently *congenital*;[7] and it is also not unfrequently accompanied

[1] Wernher, *die Augeborenen Kysten Hygrome, &c.*, p. 58.
[2] Wernher; Schuh, *über die Erkentniss der Pseudoplasmen*; Sir C. Bell, Institutes of Surgery, &c.
[3] Gmelin, in Brit. and For. Med. Rev. vol. xv. p. 236.
[4] Cyclopæd. Anat. and Physiol. art. Saliva, p. 420.
[5] See Syme, Principles of Surgery, p. 474.
[6] Brit. and For. Med. Rev. vol. xx. p. 134.
[7] Von Ammon, die Angeborenen Chirurgischen Krankheiten des Menschen, tab. viii.

by cystic tumors in other parts, as noted in the reports of many of the cases of hydrocele of the neck.

From these circumstances, it is necessary to conclude that, in very many cases, at least, of *ranula*, the tumor is not owing to obstruction and gradual distension of the gland ducts, but that it is a cyst of new formation, developed in the same manner as other cysts—from one of the gland-cells, or from the areolar tissue (see *Principles*, 3d Am. Ed. p. 303).

Others again suppose that ranula is very commonly an enlargement of a normal bursal sac which exists behind the frænum of the tongue, called sometimes Fleischman's bursa, from its discoverer.[1]—Ed.]

Two modes of treatment are applicable—restoration of the normal opening, or the making of an artificial substitute. In recent cases, the former method may succeed. The occluded original orifice is dilated by probes of suitable dimensions; and the due degree of patency and caliber is subsequently maintained, by the occasional passage of a bougie or probe for some time afterwards. In most cases, however—as in the somewhat analogous circumstances of subcutaneous encysted tumor (*Principles*, 3d Am. Ed. p. 333)—the normal orifice cannot be detected and restored. An artificial opening is made, at an anterior and dependent part. The contents readily escape; but they soon re-accumulate; and the difficulty in the case consists in keeping this artificial opening so patent as to allow of constant discharge, and consequent contraction of the secreting cyst to the capacity and character of the original duct. To effect our object, it is well to touch the aperture occasionally with the potassa fusa, as if to compel cicatrization of the margins without closure. And this object may be farther facilitated, by the occasional use of a large probe or bougie, after the caustic has been disused. Failing in our attempts thus, a seton is passed through the cyst, and retained until the requisite contraction is obtained. A piece of silver wire—retained by twisting the ends—may sometimes be found more suitable than the caoutchouc tape, or skein of silk or cotton.

Tumors beneath the Tongue.

Encysted tumors are not unfrequently found in this situation; simulating the condition of ranula very closely. The cyst is thin; the contents are clear and glairy; the size may be considerable. The remedy is by incision and cauterization. The cyst is opened anteriorly by a free puncture; the contents are allowed wholly to escape; and then to the lining membrane is applied either the nitrate of silver firmly, or the potassa fusa lightly; care being taken to confine escharotic action to the part intended. After the use of potass, rinsing of the mouth repeatedly with vinegar and water, is a safe and prudent precaution.

Fatty tumors beneath the tongue have also simulated ranula (*Principles*, 3d Am. Ed. p. 299, Fig. 61). The attachments are delicate and loose; and, for extirpation, little more than mere incision of the invest-

[1] [See Schuh; Jobert, in Brit. and For. Med.-Chir. Rev. No. 18, p. 277.—Ed.]

ing membrane is sufficient. For obvious reasons, removal by the knife cannot be practised too early.

In the after-treatment of suppurating wounds in this locality, it has already been stated that care must be taken, lest, by cicatrization, the condition of tongue-tie become established.

Salivary Concretions.

Concretions form in the extremities of the Whartonian ducts, more frequently than in connection with the parotid gland; with or without obstruction of the saliva's course. Inconvenience is considerable, by the bulk and irritation of the foreign substance. By manipulation and use of the probe, the presence of the concretions can, in most cases, be very readily detected. When of large size, they become fully exposed in the progress of working their way out by ulceration, after the manner of a sequestrum, or any other foreign substance. The operation for removal is then simple; after suitable incision, the calculus is laid hold of by forceps and extracted. But when the foreign body is small in a large containing cavity, it may retreat, and elude the attempts at seizure. In such a case, let the patient masticate any agreeable article of food; and by the outward current of saliva the concretion will be either washed away, or at least made prominent and superficial.

Fig. 102.

Salivary Calculus, of considerable size; removed by operation.

On enlargement of the tongue, see Percy, article *Langue*, in Dict. des Sciences Médicales, vol. xvii. Van Doeveren, Dissert. de Macroglossa, Lugd. Batav. 1824. Clanny, Edin. Med. and Surg. Journ. vol. i. p. 317. On affections of the tongue in general, see Brodie, Lancet, No. 1059, p. 846.

CHAPTER XIV.

AFFECTIONS OF THE UVULA AND TONSILS.

Œdema of the Uvula.

ŒDEMA of the Uvula, with a relaxed state of the neighboring soft palate, may occur singly; but more frequently it is the result of an imperfectly resolved inflammatory affection of the whole fauces. There is a feeling of very considerable discomfort in the part; the quality of the voice is altered; articulation is impeded; and not unfrequently a tickling and annoying cough exists. The various astringent gargles are of service, with attention to the general system. Failing these, stimulants and astringents may be applied directly to the part, in solution or in powder; as alum, capsicum, tannin, &c. Or the part may be touched occasionally with the nitrate of silver, or sulphate of copper, in substance or solution. In obstinate cases, it is well that scarification precede the last-named remedies.

Elongation of the Uvula.

Relaxation of the uvula, with elongation, is of no unfrequent occurrence; the extremity of the organ passing downwards, and by titillation of the glottis causing a very unpleasant and sometimes distressing cough. Sometimes the extremity is œdematous and bulbous; sometimes it is thin and fimbriated. In the slighter cases, ordinary astringents and stimulants may be tried. But when elongation is considerable, as regards both extent and duration, there is no suitable remedy but by cutting off the redundant part; an operation which has never yet been followed by any untoward consequences. The patient, seated before a good light, is directed to cough, so as to bring the pendulous uvula on the dorsum of the tongue. Then a suitable portion may be at once cut off by the stroke of sharp-cutting scissors—probe-pointed, lest the patient should prove unsteady. Or—better—by a volsella the apex is laid hold of; and then, by stretching the part, section will be facilitated as well as rendered more accurate; care being taken not to stretch until at the instant of cutting, otherwise troublesome retching is apt to ensue. Complete extirpation of the uvula has been recommended in such cases, on the plea that relapse is otherwise probable. But, even supposing the fear to be justly founded, such a ruthless proceeding is scarcely warrantable; the organ being doubtless endowed with some useful function in the general economy.

Tonsillitis, or Cynanche Tonsillaris.

This term denotes an inflammatory affection of the fauces, chiefly resident in and around the tonsils, ordinarily the result of atmospheric exposure, and characterized by swelling, redness, heat, and pain of the part, impeded and painful deglutition, inability to separate the jaws, difficult articulation, marked alteration of the voice, and the ordinary constitutional accompaniments according to the intensity and advancement of the action. Treatment is by ordinary antiphlogistics, local and general. Scarification of the part is sometimes advisable, with the view of abstracting blood, controlling swelling, and rendering suppuration less likely to supervene. Sometimes large doses of guaiac, half a drachm of the powder thrice daily, have a resolutory and almost specific influence; Dover's powder, too, is often useful in a similar way. The affection may prove formidable by assuming the erysipelatous type, and spreading downwards into the air-passages.

Abscess of the Tonsil.

An acute abscess, of some size, in the tonsil, requires active surgical interference. If allowed to follow its own course, much distress is likely to be occasioned by pain and swelling ere evacuation and subsidence take place; indeed, the swelling may be such as not only to prevent deglutition wholly, but also to impede respiration and threaten asphyxia. Besides, spontaneous bursting of the abscess may take place during sleep, and a considerable quantity of pus and blood passing suddenly into the glottis unexpectedly may induce spasmodic dyspnœa of the most formidable character, not improbably suffocating the patient. To avert such pains and perils, the general principles of surgery should be fully carried out, by artificially evacuating the pus, so soon as it has been formed. This may be readily and safely effected thus: The patient, placed before a strong light, is exhorted to great steadiness. With the forefinger of the left hand the tongue is depressed, and the mouth opened so as to expose the red and prominent tonsil, perhaps already occupying the middle of the fauces, and displacing the uvula, the ordinary occupant of that space. A straight sharp-pointed bistoury, with its back resting on the tongue, is passed into the mouth and entered into the centre of the swelling, with the point directed straight backwards, as if with the intention of impinging upon the anterior surface of the cervical vertebræ; and a puncture having thus been made, a sufficient aperture is then established by moving the instrument with a slight sawing motion. The pus escapes upon the tongue, and is discharged externally. Lateral movement of the knife, outwards and backwards, is especially to be avoided, otherwise important bloodvessels are in danger, the internal carotid artery and the internal jugular vein posteriorly, and the common trunk of the temporal and internal maxillary arteries on the external aspect.

A chronic stage is not unfrequent, in which the tonsil remains swollen, painful, and stationary, affording no sign either of recession, by resolu-

tion, or of advancement by suppuration. Such uncertainty is best dispelled, and usually at once, by the application of a blister over the part, beneath the angle of the jaw.

It is of use to remember that a patient once affected by tonsillary abscess is extremely liable to return of the affection, on the application of comparatively slight causes, until the first period of adult age has passed, and then the attacks become less frequent and severe, at length altogether disappearing.

Ulcers of the Tonsils.

The tonsils are liable to ulceration from ordinary causes; from exposure to cold or wet, from the irritation of decayed teeth, or from the "cutting" of the last grinders. Treatment is by touching the part occasionally with nitrate of silver, after removal or mitigation of the cause, extraction of the decayed teeth, or scarification of the tense gum.

Other ulcers of the tonsils are of constitutional origin, connected with taint of system, venereal, mercurial, or both; sometimes of secondary, sometimes of tertiary accession, the local characters of the sore varying according to circumstances—simple, weak, indolent, irritable, inflamed, sloughing, or phagedænic. Treatment, in such cases, is mainly constitutional.

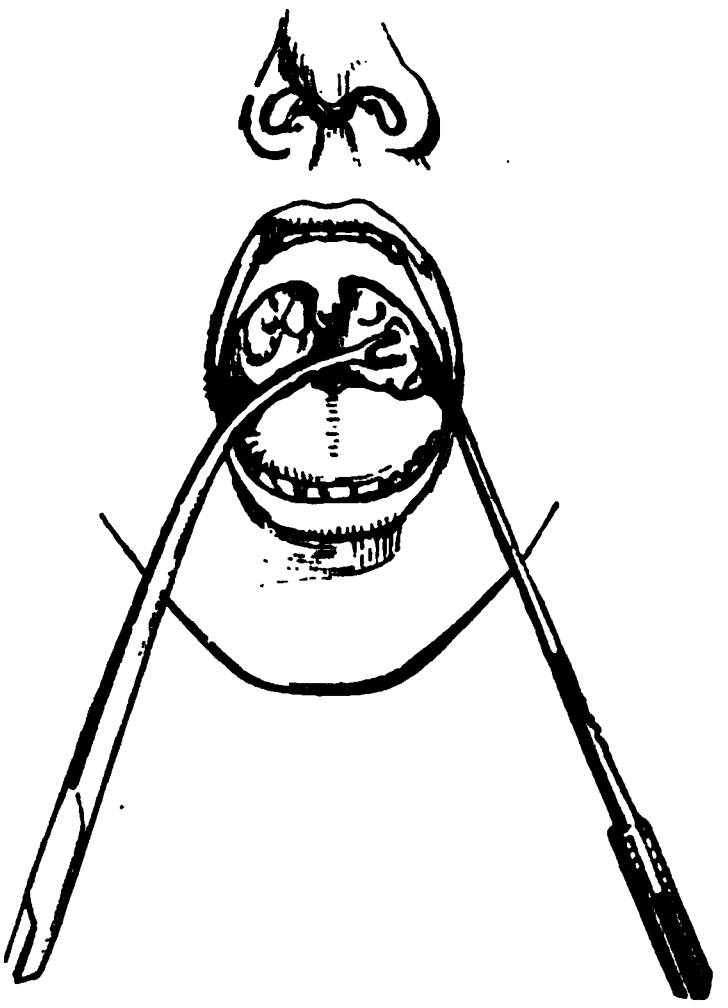
Hypertrophy of the Tonsils.

In adolescents of weak habit, chronic enlargement of the tonsils is very apt to occur, connected with a minor inflammatory affection of the fauces, the swollen part partially and slowly subsiding between the inflammatory attacks, which are of frequent occurrence and induced by slight causes. In such cases, it is not uncommon for the tonsils to become permanently enlarged, by simple hypertrophy. Both are in general affected, projecting as fleshy eminences into the fauces, interfering considerably with deglutition, somewhat with respiration, and greatly with articulation; often causing deafness, by pressure on the Eustachian tubes, and rendering the patient very liable to acute inflammatory affections of the fauces, on the slightest exposure to atmospheric inclemency or vicissitude.

In the state of excitement, mild antiphlogistics are necessary for a few days; low diet, aperients, gentle diaphoretics, sinapisms, or other light counter-irritation. In the indolent state, it is our object to amend the general health by a tonic system of general treatment; to obtain gradual subsidence of the swellings by discussion; or, this failing, to remove the redundant texture. As discutients, nitrate of silver, alum, and iodide of zinc are most in use; the first two rubbed on the parts in substance; the last applied in strong solution, by means of a hair-pencil or a piece of sponge. The constitutional treatment is as for the strumous cachexy—a condition very similar to, if not identical with the state of system found to prevail in such patients (*Principles*, 3d Am. Ed. p. 68). When discussion fails, the knife's use is expedient; not to

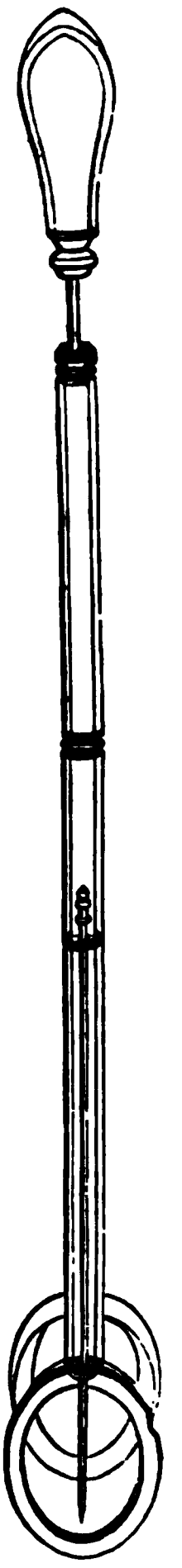
extirpate the glands, but merely to take away the redundant and projecting parts. The mouth being opened before a strong light, the promi-

Fig. 103.



Excision of the Tonsils; the knife turned the wrong way.

Fig. 104.



[Fahnestock's Instrument for removal of the Tonsils. Of all the instruments specially contrived for this object, this is probably the best; and, for operating upon young or timid persons, it is much more available than the knife or scissors.—Ed.]

nence of the swelling is seized firmly by a volsella; and, by means of this instrument, the part is made tense and steady, and brought more into the central space. A probe-pointed bistoury is passed into the mouth, with its back resting on the tongue; and its edge having been brought in contact with the lower part of the base of the swelling, section upwards is effected by a slight sawing motion. A similar procedure is repeated on the opposite side. Bleeding and pain are generally inconsiderable. The raw surfaces granulate and heal; occasional application of the nitrate of silver being made lightly, if need be. It is seldom that reproduction is even threatened.

Objections have been taken to such operations, on the ground that dryness of the fauces is apt to follow, with imperfect articulation; and that, sometimes, also, there has seemed to be a certain amount of sexual impotence induced. The experience of most surgeons does not tend to sustain such objections; at the same time there is no doubt that most cases of chronic enlargement of the tonsil, in adolescents, can be got rid of by local discutients and constitutional alteratives, and that, therefore, operative interference should be reserved wholly for those cases which have been found to resist milder means.

Extirpation of the entire tonsil, by ligature, or by knife—the one operation very hazardous, the other accomplished with great difficulty—is, in the present day, never contemplated, being well superseded by the partial removal just described.

Malignant Disease of the Tonsils.

Cancerous ulceration may extend to the tonsil from the tongue, or may originate in the gland itself. The latter event is rare.

Carcinomatous or medullary tumor may occupy the tonsil, as a primary disease; but more frequently such enlargement of this part is but an extension of malignant disease from the lip or lymphatic glands.

All such affections are incurable; and operative interference is out of the question—unless, indeed, at an advanced period of the case, temporary relief by bronchotomy be deemed advisable, on account of impending asphyxia.

Le Cat, Mémoire sur l'extirpation des amygdales squirrheuses, Journal de Médecine, vol. ii. 1755. Louis, sur la resection des amygdales, Mém. de l'Académie de Chir. vol. v. p. 423. Lisfranc, Considérations, &c. sur la Luette, Revue Médicale, July, 1823. Watson, Lectures on Practice of Medicine, vol. i. London, 1843; Allan Burns, Surgical Anatomy of Head and Neck, Edinburgh, 1811; Harvey on Excision of the Enlarged Tonsil, London, 1850.

CHAPTER XV.

AFFECTIONS OF THE PHARYNX.

Pharyngitis.

The inflammatory process, affecting the pharynx, pre-eminently or solely, is of comparatively rare occurrence. Most frequently it is the result of a direct exciting cause; as the lodgement of foreign bodies, or the contact of acrid substances. The membrane becomes red and swollen, at first dry, afterwards affording an increased and perverted secretion; deglutition is difficult and painful; pain is felt on pressure from without; and the ordinary constitutional symptoms attend. The action may simply resolve; or ulceration may take place in the membrane, with copious purulent discharge; or the submucous tissue may become the seat of abscess; or by submucous deposit of plastic matter, and change of structure in the membrane itself, contraction of the pharyngeal space may result.

Pharyngeal Abscess.

When matter has formed beneath the mucous membrane, a fluctuating, yet tense swelling may be perceived; and deglutition becomes more and more impeded, according to the increase of the tumor. In children, the affection is apt to simulate croup.[1] Treatment is by early and free evacuation. The ordinary site of abscess is on the posterior aspect of the pharynx, in front of the cervical vertebræ and their coverings; and here cutting instruments may be used in all security. If the abscess be large, it is well to use a trocar and canula, lest the pus, suddenly escaping in quantity, might endanger suffocation by passing into the windpipe. If opening be delayed, not only are risk and inconvenience great by the large size of the tumor; there is also the same danger from sudden spontaneous discharge, as in abscess of the tonsil; besides, the bones may be involved by a burrowing of the matter; and, in the ultimate cicatrization of a large cavity, contraction and stricture of the pharynx may result.

Stricture of the Pharynx.

Simple stricture may be the result of simple pharyngitis, causing structural change in the mucous membrane, with accumulation of plastic

[1] *Vide* Monthly Journal of Medical Science, August, 1846, p. 146. Ibid. October, 1847, p. 220.

deposit in the submucous tissue; and, on the latter occurrence, the contraction mainly depends. Or it may be the consequence of ulceration of the membrane, with or without suppuration in the parts beneath. The prominent and characteristic symptom is difficulty of swallowing, more especially of solid and imperfectly masticated food. And certainty of the existence of the change is determined by the use of a probang or tube, whose passage downwards is resisted by the contracted part. The ordinary site of contraction is at that part of the cavity which is naturally most narrow—the lowest.

Malignant contraction is produced by carcinomatous formation in the mucous and submucous tissues; the surface speedily assumes the open condition, and much unhealthy matter is discharged. The symptoms are, great pain in the affected part, increased by motion and pressure; expectoration of fetid, copious, bloody discharge; great and increasing difficulty in swallowing; gradual wasting of the frame, partly by inanition, partly by progress of the usual malignant cachexy.

The simple stricture is treated by dilatation. A probang—a rounded piece of whalebone, with a bulbous extremity made of ivory—is passed gently down to the obstruction; or a gum-elastic bougie may be used for the same purpose. One having been selected of such a size as will pass without the use of force, it is lodged in the contracted part, and retained there for some time, according to the sensations of the patient. After a day or two, the irritation caused by the former instrument having subsided, another, a size larger, is similarly employed. And thus, gradually, the normal caliber is restored. An instrument of full size should be passed occasionally, however, for some time afterwards, to obviate the tendency to recontraction, which exists in all mucous canals so affected. The object of the passing of instruments is, not to excite inflammation or ulceration in the contracted part, for this would plainly tend to ultimate aggravation of the morbid state; but to excite absorption of the submucous deposit, and a resolutory action, with discharge, in the membrane itself. At the same time, some benefit is also obtained by mechanical dilatation.

The *malignant* stricture admits only of palliation. Great attention is paid to the administration of nutritive ingesta, so as to husband the failing strength; while pain and discomfort are assuaged by opiates. Direct interference with the part, by means of bougies, or otherwise, with dilatation in view, cannot but do harm. Often, however, the pain of the ulcerated surface may be relieved, by occasionally touching it with a solution of the nitrate of silver.

Spasm of the Pharynx.

In patients of nervous temperament, prone to hysteria, with stomach and bowels disordered, spasm of the muscles of the pharynx is not an unfrequent occurrence; causing pain in the part, with an uneasy and apprehensive feeling of tightness, and materially interfering with deglutition. The attacks are only occasional, sudden in accession, and gradual in remission. The treatment is mainly constitutional; of an alterative, tonic, and antispasmodic character. Locally, external

counter-irritation of a slight grade, or opiate friction, or a belladonna plaster over the nape of the neck, may be of service. Sometimes even the passing of the probang will not convince the hysterical patient that the affection is merely nervous.

Paralysis of the Pharynx.

This, occurring in the sequel of any disease, is usually of very unfavorable import; denoting affection of the brain, probably by effusion, which is likely to prove fatal. It may occur singly, however, as after external injury of the head or neck, and then the prognosis may be somewhat more hopeful. The prominent symptom is simple dysphagia, without obstruction to instruments, or any other sign of stricture in the passage. Treatment is to be directed mainly to the head and neck, by counter-irritation, and such internal remedies as may seem advisable; while life is meanwhile sustained by supplying the stomach with nutritive fluids, by means of a tube passed into the œsophagus.

Sacculated Pharynx.

Sometimes the lower part of the pharynx becomes dilated into a pouch, of greater or less size, situate immediately behind the œsophageal orifice. Food lodges there, sometimes for many hours, coming up again in a kind of rumination. Deglutition is difficult and imperfect; often accompanied, especially when liquids are taken, with a churning noise. Frequently, too, there is a copious secretion of glairy mucus; sometimes accumulating spontaneously in the mouth, more commonly brought up by hawking. The affection plainly admits of no direct treatment; and care must be taken in using the probang—should that be thought necessary for an exact diagnosis—lest it should enter the pouch, and be forcibly impelled thence through the parietes.

Tumors of the Pharynx.

Tumors occasionally, though rarely, form in the pharynx. They are troublesome by the dysphagia which their bulk necessarily occasions, and dangerous by the tendency which all tumors have to enlargement and degeneration. They may be simple, and of the polypous character, and these may be detached by ligature, applied to their base by means of a double canula. Or they are *medullary;* and then irremediable.

Foreign Bodies in the Pharynx.

Portions of food, and other articles held in the mouth, not unfrequently become arrested in their passage downwards; even though no abnormal contraction exist at any part of the canal. Substances of some size and solidity are likely to rest at the narrowest—the lowest—part of the pharynx. Those of a slim and spiculated character, on the contrary—as needles, pins, fish bones, pigeon bones, &c.—are more frequently entangled in the folds of the soft palate. In both situations,

the foreign matter is within reach of the finger; and this is the best instrument by which to ascertain the exact site and nature of the lodgement—as well as the best guide to the forceps in extraction. Even a minute substance entangled in the fauces causes much discomfort; and besides, if not removed, will probably induce a certain amount of inflammatory action. But the larger and solid substances, lodged lower down, call more urgently for our aid; inasmuch as by their bulk and pressure, and by the spasmodic movements which their irritation induces in the larynx, they threaten suffocation. The patient is seated firmly on a chair; the fore-finger is thrust determinedly into the fauces, and its point is moved about in every direction, until either the foreign substance is discovered, or the surgeon is satisfied that there is no foreign body there. Much retching will be occasioned in all probability; but this must be unheeded by the examiner, and endured by the patient; perquisition of the soft palate being got over as speedily as possible, the extremities of the nerves concerned in the production of vomiting being chiefly situated there. The presence and site of the foreign body having been ascertained, it is seized by forceps, and gently withdrawn. For pins and small bones in the arches of the velum, the ordinary dressing-forceps, or merely the finger-nail, will suffice. For solid matter lodged lower down, longer forceps, gently curved at the extremity, are more suitable.

It is important to remember that very frequently the painful sensation of a foreign body lodged in the pharynx remains, after the substance itself has passed down into the stomach. When, therefore, we have made a careful examination of the parts, and satisfied ourselves that no foreign body is there, we treat such abnormal sensation by leeching, followed by counter-irritation, or by anodyne embrocation.

The passing of Instruments by the Pharynx.

The surgeon is not unfrequently called upon to pass instruments into the pharynx and œsophagus; curved forceps for the extraction of foreign bodies; probangs and bougies for the propulsion of impacted articles of food, or for the relief of simple organic stricture; hollow tubes for the conveyance of nourishment into the stomach, in cases of wound of the pharynx or œsophagus—as in cut throat; and the tube of the stomach-pump, in cases of poisoning. The points to be attended to are—to use all gentleness, so as to avoid lesion of the lining membrane of the canal; and to take especial care, particularly when it is our object to throw in ingesta, that the tube does not pass into the air-passage. If the patient be sensible, he is seated on a chair, with the head thrown much back, so as to bring the upper part of the alimentary canal into as straight a line as possible. The mouth having been opened wide, and the tongue depressed with the left fore-finger, the tube is moved rapidly past the soft palate, so as to avoid retching; and its extremity is then gently propelled, resting on the posterior part of the pharynx and made to glide, as it were, on the anterior surfaces of the vertebræ in its passage downwards. When the instrument's point is opposite the rima glottidis, the patient is directed to make an effort to swallow his saliva; or, with

the left hand, the surgeon raises the box of the larynx, and at the same time pulls it gently forwards from the œsophagus; such movement being plainly conducive to the free passage of the instrument into the latter canal. When insensibility exists, the operation is in one way facilitated; inasmuch as there is no resistance on the part of the patient. But, in such cases, it is plain that our care to insure a right passage for the instrument must be doubly exerted; the patient having no power to warn us of a threatened deviation from the proper track. In most cases, it is well to assure ourselves fully that the tube is in the œsophagus, and not in the larynx, before fluids are passed downwards to the stomach. For this purpose, a sheet of paper may be placed over the face, with the extremity of the tube projecting through it; while in front of the tube a lighted taper is put, which by the paper is effectually screened from the flatus of the nostrils in expiration. If, on expiration, the flame remain steady, no air impinging on it, we may proceed with injection; the tube is certainly in its right place. If the flame be extinguished, or even made to bend considerably, it is equally plain that an error has been made; and that injection would almost certainly occasion fatal asphyxia. It is possible, however, that the flame may be affected a little in expiration, although the tube be quite in its right track. For, it is probable that in inspiration a certain amount of air may pass downwards by the tube, which during expiration may be again extruded.

It is well to remember that a large instrument is preferable, in such cases, to one of small size; being much less likely to enter the windpipe. And it is also worthy of note, that, in emergencies, a syringe is not essential to effect clearance of the stomach; a tube having been passed, the fluid contents of the stomach may be made to flow out by it, on merely bending the body, and bringing the mouth to a lower level than that of the epigastrium. When a syringe is employed, it should always be with caution; otherwise, ecchymosis and laceration of the gastric mucous membrane are not improbable.

Also, unless previously aware that the stomach contains much fluid, it is prudent to begin the operation by injecting tepid water, which is afterwards pumped out along with the previous contents; and this injecting and ejecting may be repeated as often as may seem necessary, with the double view of washing out the viscus thoroughly, and at the same time avoiding injury to the lining membrane.

Watson, Clinical Lecture, Med. Gazette, vol. xvii. Kunze, Commentatio Pathologica de Dysphagia, Lips. 1820. Monro, on the Morbid Anatomy of the Gullet, Edin. 1830. C. Bell, Institutes of Surgery, vol. i. Appia, de Stricturis Œsophagi, Heidelb. 1842.

CHAPTER XVI.

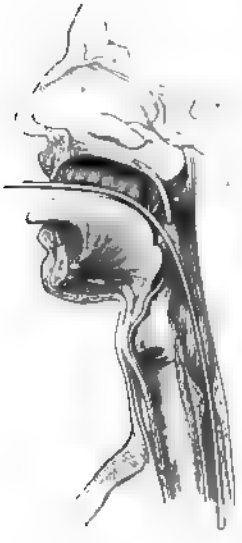
AFFECTIONS OF THE ŒSOPHAGUS.

Stricture of the Œsophagus.

ŒSOPHAGITIS, of a most intense character, is occasionally induced by the swallowing of acrid fluids, as scalding water, the nitric or sulphuric acids, soap lees, caustic alkalies, &c. A more moderate action may be induced by slighter causes, or may occur when no cause can readily be assigned, and its probable result will be contraction of the canal, partly by change of the mucous membrane, partly and mainly by submucous deposit.

But contraction of the œsophagus may be of three kinds, as in the case of the pharynx. It may depend on spasm, of sudden accession, and only occasional; removable by general treatment. Or it may be the result of a chronic inflammatory process, of gradual approach, constant, and curable only by a cautious use of the simple probang or bougie. Or it may be caused by structural change of a malignant kind, followed speedily by ulceration, and capable only of palliation.

Fig. 105.



Stricture of the Gullet, at its most ordinary site. A bougie shown introduced by the mouth.

The simple organic stricture is of most frequent occurrence. Its ordinary site is at the narrowest part of the canal, opposite the cricoid cartilage. When tight and of considerable duration, the tube is prone to become dilated above the strictured part, forming a pouch in which food inconveniently accumulates. The constrictors of the pharynx are usually hypertrophied, and the upper cornua of the thyroid cartilage may become closely approximated.[1] Above the stricture, too, ulceration is apt to take place, which, though not malignant, is nevertheless very intractable, and most inconveniently complicates the case. Besides, in consequence of obstruction to deglutition, the system is apt to suffer more or less by an approach to inanition, and therefore it is obviously our duty to commence the suitable remedial interference at as early a

[1] Lancet, No. 1209, p. 483.

period as possible. In using the bougie, even more gentleness and care, if possible, are expedient, than in the case of strictured pharynx, force being more likely to produce lesion of the membrane, and even to cause perforation of the tube. It has happened that the head of a probang, supposed to have passed on to the stomach after having overcome the stricture, has been found, after death—at no distant date, and not unconnected with the event—to have lodged in the mediastinum! Another precaution is equally necessary, namely, to beware that there is no error in our diagnosis, to be certain that the contraction is really caused by structural change in the œsophagus itself, and not dependent on the pressure of an aneurismal or other tumor. It is easy to understand how the thrust and pressure of a probang or tube, acting on the parietes of an advancing aneurism, may fearfully accelerate the fatal issue.

Foreign Bodies in the Œsophagus.

Foreign bodies, whether obtuse and globular, or sharp and angular, portions of meat, or bones, pins, &c., become arrested usually at the narrowest part of the canal, nearly opposite the cricoid cartilage. Or, lodging there in the first instance, they become displaced either upwards or downwards, usually in the latter direction, by the efforts either of the patient or of those whom he calls to his aid. The result varies, according to circumstances. There may be simply an irritation produced by the presence of a foreign body, with more or less dysphagia, or an inflammatory process is kindled, and advances perhaps to suppuration and ulceration, or by the pressure and irritation of a bulky substance life may be immediately perilled by impending asphyxia. Or, as very frequently happens, the foreign body slips down into the stomach, leaving, however, a marked sensation of its presence at the site of its temporary arrest.

The presence of foreign matter is ascertained by the bent forceps or by the probang, passed carefully down and moved gently. According to the nature of the substance, either extraction or propulsion is practised. If the obstructing body be a piece of meat, or other article of food, not likely to injure the canal in a forced passage, and capable of being subsequently digested in the stomach, it is the simpler practice, and perfectly warrantable, to push the foreign substance gently downwards by means of the probang. When, however, the circumstances are of an opposite character, as usually happens—when we are satisfied that the œsophagus cannot fail to sustain lesion in attempts at propulsion, and that the stomach will be unable to make any satisfactory impression on the substance, should it be received there, extraction is invariably to be preferred. Long, curved forceps are the most generally available instrument, the surgeon being provided with two pairs, of opposite movements in the blades. The one having missed the foreign substance, when this is narrow or flat, the other can scarcely fail to seize it. Seizure having been made, dislodgement from the parietes of the canal is to be effected by a cautious wriggling movement of the hand, before extractive power is applied, to avoid unnecessary

injury of the parts. Needles or pins may be entangled in loops of thread attached to the end of a piece of whalebone, passed down to the

Fig. 106.

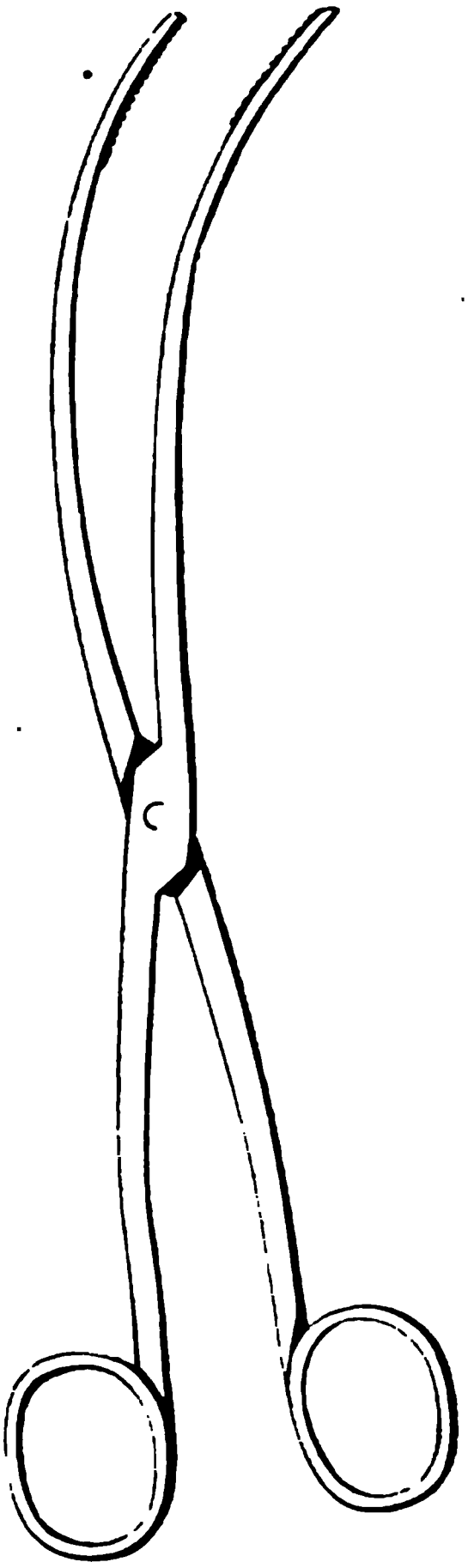


Fig. 106. Forceps for extracting foreign bodies from the pharynx and œsophagus.

Fig. 107.

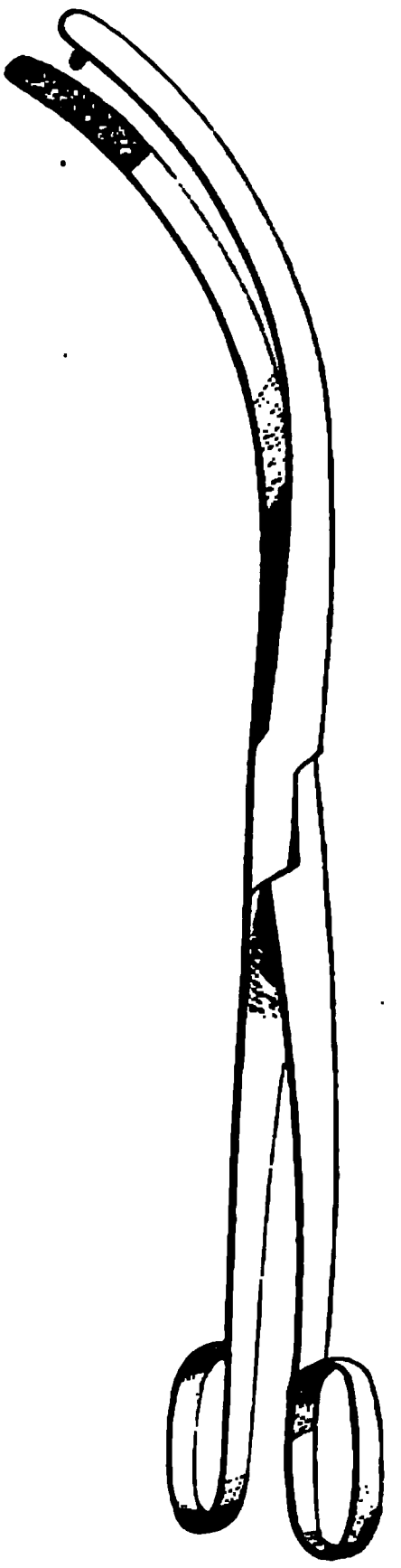


Fig. 107. The companion Forceps to Fig. 106, opening in the opposite direction.

site of lodgement, and moved gently about. Flat substances, such as coins, presenting their edges to the operator, may be brought up by a flat and broad blunt-hook. When no instrument is at hand, and the case is urgent, extrusion of the foreign substance may be effected by exciting vomiting, and this may be done either by administration of the ordinary emetics, if swallowing be at all practicable, or by mechanically tickling the fauces.

When indigestible substances have passed into the stomach, they usually find their way to the surface, by the natural outlet—per anum; passing off with the feculent matter—often but little changed—after the

lapse of some time. To assist the downward movement, purgatives are often employed. If the foreign body be solid and obtuse, no harm is done, and extrusion will probably be expedited. But if the substance be sharp and spiculated, the practice cannot but be mischievous; tending to produce entanglement in the mucous membrane, probably with perforation of the bowel; and also tending to kindle inflammation in the affected part. In such cases, therefore, it is more prudent to await the working of nature. Needles and pins usually do perforate the intestinal canal; but, if left to themselves, the process is gradual, accompanied by protective plastic exudation, and consequently harmless. In due time, the foreign body appears at the surface, as if soliciting extraction—perhaps months after the date of its entrance, and after having traversed a most circuitous route. Fish-bones, and bones of rabbits or other small animals, are not unfrequently arrested by the sphincter of the anus, after having safely made the passage above; and may require the use of both knife and forceps for their removal. Cherry-stones, and such like substances, may lodge in the vermiform process of the caput cæcum, and excite either abscess there or general peritonitis.

Occasionally, though rarely, it happens that the foreign body will move neither up nor down in the œsophagus. Extrusion and propulsion having both failed, excision is the only other resource. The substance is cut down upon from without, and extracted through the wound.

Œsophagotomy.

The neck is stretched, by elevating and throwing back the head; and, by the fingers of an assistant, the foreign substance is made to project as much as possible on the left side of the trachea; [or, a stout probang may be passed down to the obstruction, and its point be pressed against the side of the gullet, so as to make the latter prominent.—Ed.] A free incision is made over the swelling, through the skin and platysma myoides; and then, by a cautious and more limited use of the knife, the œsophagus is exposed in its most projecting part. Here it is penetrated by the knife; and the opening thus formed is afterwards dilated to a sufficient extent, partly by the finger, partly by slight touches of the knife's edge. The offending matter is laid hold of by the finger, or by forceps, and removed. Hemorrhage having been arrested, the wound is brought accurately into apposition, and treated for adhesion. For some days a tube is worn, passed by the mouth; and through this the necessary nourishment is conveyed, clear of the wound.

It may be imagined that foreign substances may be safely left to loosen themselves by suppuration, and so to facilitate, if not effect, their own extrusion. But experience declares that it is not so. The obstruction to deglutition, and impediment to breathing, are themselves circumstances sufficiently untoward to demand prompt interference. The inflammatory process, too, which is sure to follow, is fraught with both disadvantage and danger; it may lay the foundation of a formidable organic stricture; it may cause a troublesome abscess, resulting perhaps in a fistulous opening in the canal; or, in a low site, ulceration may open into the arch of the aorta, and prove speedily fatal.

[Œsophagotomy has been performed also in a few instances of aggravated *organic stricture of the œsophagus*, in which other means had been long tried in vain, and in which death from inanition was imminent. But the incurable nature of the disease which generally produces the stricture, the dangers, difficulties, and ultimate fruitlessness of the operation, the possibility of nourishing the patient *per rectum* for a considerable time—these and other considerations must render the operation an unadvisable one.

The reader will find an interesting paper on this subject, together with the report of a case of œsophagotomy, by Dr. Watson, of New York, in the *Am. Journal*, vol. viii. N. S. The difficulties and obstacles to be overcome are therein narrated; they are so great, that Dr. Watson suggests that gastrotomy might be preferable. But, although the latter operation is easy enough of accomplishment, and although an abundance of nutriment might be readily introduced thereby, it can scarcely be called a more *eligible* proceeding than the other.—Ed.]

Palsy of the Œsophagus.

This, like the corresponding affection of the pharynx, is usually of evil import; betokening disease of the nervous centres. Inability to swallow may be complete; but the probang meets no obstruction.

In some cases, benefit may be derived from counter-irritation and use of galvanism; but in most we must be contented with palliation—sustaining life by matters introduced by means of the stomach-pump, as well as by nutrient enemata.

Kunze, Commentatio Pathologica de Dysphagia, Lips. 1820. Monro, on the Morbid Anatomy of the Gullet, Edin. 1830. C. Bell, Institutes of Surgery, vol. i. Arnott, on Œsophagotomy, Med.-Chir. Trans. vol. xx. Appia, de Stricturis Œsophagi, Heidelb. 1842. [Smith's Operative Surgery, p. 277; Mott's Velpeau, vol. iii. p. 496; Fergusson's Pract. Surgery.—Ed.]

CHAPTER XVII.

AFFECTIONS OF THE EAR.

Foreign Bodies.

CHILDREN are apt to insert foreign matter into the meatus auditorius, as well as into the nostrils. Dislodgement and extrusion are effected by the same means; by the stream of water injected; or by the use of a flat and bent probe, or curette. Forceps are a still more reprehensible instrument here, than in the case of the nostril; for impaction is not only more probable, but likely to be followed by much more serious results. Abortive attempts to dislodge, by forceps, have occasioned deeper entrance, disruption of the internal ear, intense otitis, and death.[1]

Larvæ have lodged in the ear; causing severe inflammation there, with much local suffering, and grave constitutional disturbance. *White Precipitate*, suspended in milk, is found successful in killing the animals, when injected; and they may be subsequently removed by forceps, curette, or a stream of water.[2]

Polypus of the Ear.

Two forms of polypi may form on the lining membrane of the meatus externus—usually from that middle part of the meatus which furnishes the cerumen; one soft and pulpy, analogous to the common mucous polypus of the nose; the other more firm and fleshy, resembling rather the solid polypi of the uterus; both simple in structure and tendency. Deafness is occasioned, along with uncomfortable sensations in the part; and more or less discharge escapes, of a puriform and offensive character. Treatment is by evulsion; slim forceps being employed for this purpose, as in the case of nasal polypus. By the use of the ear-speculum, cautiously introduced—an instrument similar to the nasal speculum, only of a more tubular extremity, suited to the cavity which it is intended to explore—the site of growth is ascertained; there the seizure by forceps is made; and, by slight torsion combined with evulsion, extirpation is effected. Or the attachment may be divided by means of blunt-pointed scissors. When the growth springs from near the membrana tympani, however, evulsion is not safe; and it is better to destroy it by caustic—such as the potassa cum calce.[3] When bleeding has ceased and pain subsided—after the use of forceps or scissors—it is

[1] Lancet, No. 1062, p. 458. [2] Ibid. No. 1344, p. 588.
[3] Toynbee, Medical Times and Gazette, Jan. 3, 1852.

well to touch the part with nitrate of silver, so as to diminish the chance of reproduction. And if the morbid structure should not have been entirely removed, such cauterization may require repetition from time to time. During the healing process, relaxation of the membrane, with copious discharge, is apt to prove troublesome; demanding the daily and repeated use of gently stimulating and astringent injections.

Fig. 108.

[A more simple and equally useful Speculum for the Ear, recommended by Mr. Wilde, of Dublin. It is made of silver, highly polished on the inside; various sizes should be made, for ears of different dimensions. (From Druitt.)—Ed.]

Fungoid granulations, of a polypous character, not unfrequently spring from the membrane of the meatus, in cases of long-continued otorrhœa. They grow from the lower part of the tube, or from the membrana tympani itself; and, when of large size, may simulate polypus. They are got rid of by nitrate of silver, used escharotically, and by the subsequent employment of astringent injections.

Otitis.

The inflammatory process may attack the mucous membrane of the ear, and textures connected therewith, either on the exterior or on the internal aspect of the membrana tympani. In the one case, the affection is said to be external; in the other, internal.

External Otitis.—This most frequently occurs in the young; the result of exposure to cold, with or without irritation, caused by affections of the teeth or gums. It constitutes the common earache, from cold; the pain being that which attends on the ordinary inflammatory process, occurring in a part of extreme sensitiveness. The action may simply resolve; or it may cause a puriform exhalation from the membrane; or abscess may form beneath the membrane, pointing, discharging, and causing much aggravation of distress. Treatment is simply antiphlogistic; leeching behind the ear, fomentation, hot poultices, purges, and antimony. When abscess forms, activity in the application of heat and moisture is redoubled; and, as soon as the appearance of matter is presented, evacuation is effected by puncture.

Internal Otitis is a more serious affection, and may be variously induced, by injury, exposure to cold, or extension of a more outward attack. Pain may not be more acute, but is deeper seated, and more intolerable; attended with throbbing, and confusion of the head; the system sympathizing in well-marked inflammatory fever. If the action proceed to suppuration, disruption of the internal ear, with loss of hearing, is all but inevitable; and, very probably, a still more serious result may ensue, namely, affection of the interior of the cranium. Treatment is actively antiphlogistic. When certain that acute internal otitis exists, we will not content ourselves with leeching behind the ear, but may take blood both from the part and from the system. Calomel and opium, too, will be administered; the invasion of an organ of delicate texture, of important function, and in near connection with the brain, being sufficient warrant for such procedure (*Principles*, 3d Am.

Ed. p. 169). In short, the best efforts will be made early and satisfactorily to subdue the rising process, so as to prevent suppuration, if possible. When matter has formed in the cavity of the tympanum, the membrana tympani acts injuriously, by repressing outward discharge of the abscess; occasioning tension, with aggravation of the symptoms. Here the general rules of surgery are to be fulfilled, by incising the tense, resisting membrane—which is seen white and prominent—so soon as we are satisfied, by its change of color and form, and the course of the general symptoms, that intra-tympanal suppuration has taken place. The membrane must yield, ultimately, by ulceration or sloughing; probably too late to save the delicate and complicated apparatus of hearing from irreparable injury; perhaps too late to prevent extension of aggravated inflammatory action to the brain or its membranes.

Chronic internal otitis is common; less formidable than the acute form at the time of invasion, but prone, if unchecked, to lead to equally serious consequences. The membrane may be simply changed in structure; thick, rough, and vascular; clogging and enveloping the ossicula auditus. Or suppuration may take place, with perforation of the membrana, and probably with ultimate necrosis, and discharge of the ossicula. Treatment consists in attention to the general health, alteratives, and patient counter-irritation.

Otorrhœa.

By this term is understood a puriform or purulent discharge from the ear; the result of chronic inflammatory action. Usually it is preceded by the ordinary signs of an attack of otitis, acute, or subacute in character. Children are most liable to this affection; and especially those of strumous habit. Often it is one of the sequelæ of scarlatina. It is well to examine the meatus attentively, by means of the speculum, discharge having been previously removed by gentle ablution. For if the membrana tympani be found entire, and tolerably sound, the affection is so declared to be comparatively simple; whereas, if that membrane be found imperfect, denoting an internal origin of the suppuration, prognosis is rendered more guarded and unfavorable.

It must never be forgotten that the term Otorrhœa, in truth, comprehends many affections; inflammation of the external ear, of the cavity of the tympanum, or of the mastoid cells. And it is equally important to observe that inflammation begun in the external meatus may at any time extend to the other parts, and thence to the contents of the cranium, from the tympanum to the cerebrum, and from the mastoid cells to the cerebellum.[1]

Treatment is mainly palliative and expectant, as regards the part, restorative as regards the system. The constitutional cachexy is to be

[1] "No person suffering from chronic catarrhal inflammation of the dermoid layer of the meatus, the membrana tympani, or of the mucous membrane of the tympanum, can be assured that disease is not being prolonged to the temporal bone, the brain, and its membranes; and that any ordinary exciting cause, as an attack of fever or influenza, a blow on the head, &c., may not induce the appearance of acute symptoms, which, as a general rule, are speedily fatal."—Toynbee, *Med.-Chir. Trans.* vol. xxxiv.

combated by the usual means. The ear is kept clean by frequent and careful use of tepid water, without and within the meatus. The state of the mouth is looked to, and, if need be, amended. Reaccessions of inflammatory action are averted or subdued by occasional leeching and fomentation, as circumstances may require. The chronic action, which is maintaining the structural and functional disorder of the mucous membrane, is sought to be overcome by careful counter-irritation, such as blistering behind the ear; this, however, being proceeded with cautiously, lest enlargement of the glands of the neck, which frequently is an accompaniment of otorrhœa, should be either induced or aggravated. When nearly all the symptoms of inflammatory action in the part have subsided, and when the general system has decidedly improved, weak astringents may be employed to favor recovery of the membrane, and consequent cessation of the discharge. This part of the treatment, however, must always be conducted with the greatest possible care, lest, by sudden arrest of the discharge, return of the inflammatory attack in a deeper site, and in an aggravated form, should unhappily ensue. Such risk is in all cases great when sudden arrest of discharge has occurred from any cause, but especially in those cases in which implication of the internal ear is indicated by imperfection of the membrana tympani, and perhaps previous discharge of the ossicula auditus.[1]

Otorrhœa in the adult may be connected with the lodgement of foreign matter in the meatus, long overlooked. A grass-seed, or such like substance, may be extruded after many years, otorrhœa, occasional or constant, having been maintained during the whole period of its residence.

Otorrhœa is occasionally connected with a degenerated condition of the pars petrosa of the temporal bone, which has softened and become converted into a medullary mass. The symptoms are cerebral and obscure. The issue is hopeless. And it is very plain that the fatal event would certainly be much accelerated by a successful attempt to arrest the aural discharge.

Abscess of the Mastoid Cells.

Inflammatory action may originate in the cancellated texture of that part of the temporal bone which constitutes the mastoid process. It may be the result of external injury; more frequently it occurs without any appreciable exciting cause in systems of the strumous character, and is most especially liable to invade those whose original cachexy of system has been aggravated by imprudent exhibition of mercurials. Like the preceding affection, it is most frequent in the young. But very often this disease is but the extension of an originally mere outward affection, namely, long-continued inflammation of the external meatus. If suppuration be attained to, as is extremely probable, caries may hardly fail to be established, and is usually complicated with

[1] An analogous affection occurs in connection with the nose. Purulent discharge has taken place for some time from the nostril; suddenly it ceases, death ensues, with head symptoms, and on dissection caries of the cribriform plate of the ethmoid bone is found, with corresponding affection of the brain.

necrosis, portions of the osseous texture separating in the form of sequestra. From the near connection of the posterior surface of the cells with the dura mater of the cerebellar cavity, it can easily be understood how readily in advanced cases the latter texture may be involved. The lateral sinus, too, is in close contact, and perforation of this vessel gives rise to two formidable dangers, hemorrhage and pyæmia.

Supposing the affection to be primary, treatment in the first instance will be directed to averting suppuration and caries, if possible, by the ordinary means. When there is reason to believe that matter has formed, we shall be very anxious to obtain an early and sufficient opening externally, and thus to limit the mischief already done. Otherwise there is great danger by extension. The internal ear having been involved, hopeless deafness will ensue; paralysis of that side of the face is not unlikely, from implication of the portio dura; nay, it is possible that the contents of the calvarium may be attacked, as already stated, directly and imminently perilling existence. But, independently of such aggravations, life may be hazarded by the hectic of a continued and wasting discharge.

From local treatment alone but little good need be expected; constitutional means must be at the same time and sedulously employed. When employing counter-irritation, the blister should not be placed over the part affected, otherwise the morbid action might be increased, but at a distance, as on the nucha, or between the shoulders.

Otalgia.

This constitutes true earache, a neuralgic affection, unconnected directly with the inflammatory process. Very frequently it is connected with irritation in the mouth. The pain is very distressing, and has all the characters of neuralgia. It is amenable to the same treatment (*Principles*, 3d Am. Ed. p. 587), search for a dental cause or connection never being neglected. Among the anodynes suitable for application to the part, aconite and belladonna deserve a prominent place.

Deafness.

Deafness may proceed from the affections already mentioned, and from many causes beside. In order to arrive at a true diagnosis, careful examination of the external meatus and of the membrana tympani is essential, and to effect this the well-made speculum is of great service.

Deafness is very frequently occasioned by *accumulation of inspissated cerumen* within the meatus. Or, perhaps, obstruction to the vibrations of sound is rendered still more effectual by commixture of wool or cotton with the cerumen, the patient having been in the habit of negligently stopping his ears, besides forgetting to practise requisite cleanliness. The presence of obstruction will be at once declared by use of the speculum; and often that is not necessary, tension and

straightening of the tube by pulling the lobe, before a clear light, being sufficient. Remedy consists in removing the offending mass. And this is best effected by washing out the meatus with warm water by means of a stout syringe. Instruments, such as are employed for gonorrhœa or for the injection of sinuses, are wholly inefficient; the syringe should be of metal, well valved, and of considerable power. And the injection is persevered in, either at one or at repeated sittings, until the membrana tympani is disclosed clear, on the use of the speculum. When the cerumen is unusually hard and tenacious, it may be loosened, previously to syringing, by the careful use of a curette, or by moistening it with bland oil for a day or two.

Deficiency of ceruminous secretion is an occasional but much less frequent cause of deafness. The meatus is found dry and empty, and the membrana tympani is seen clear and glistening. Stimulants are of use in restoring the secretion, as the essential oils, more or less diluted, and their action may be farther assisted by stimulant friction around the auricle. Exhaustion of the cavity is said also to have a beneficial effect, by means of a syringe, fitted with a soft nozzle which completely occludes the meatus. Until the normal secretion returns, glycerine, applied by means of a hair pencil, will be found a valuable substitute.[1]

Thickening of the lining membrane of the meatus is a cause of deafness, the result of chronic inflammatory action. It is to be treated by the application of gentle stimuli, such as solutions of nitrate of silver, sulphate of zinc, &c., which are best administered by means of a hair pencil. Rectification of the general health, and counter-irritation behind the ear, are often useful auxiliaries.

The *membrana tympani* may be changed in structure, thickened, and congested, the result of inflammatory action. Similar treatment is advisable, the stimulants being applied by means of injection, except when the membrane is imperfect, and then again the hair pencil becomes preferable, lest undue excitement be caused in the internal ear. Imperfection of the membrane, by ulceration or by rupture in consequence of external injury, may be repaired by nature's effort. If not, hearing may be much quickened by applying a small shred of lint, or cotton wool moistened in glycerine, over the aperture.[2]

By *hypertrophy of bone*, the osseous meatus may be so contracted and changed as to produce a considerable amount of deafness, an affection obviously but little amenable to treatment.

The *internal ear* may be disordered, and on this cause the great majority of cases of deafness are found to depend.[3] The change may be in the lining membrane, in the osseous texture, or in the nerves. Fortunately, modern research has declared the most usual site of disorder to be the texture first named, the one most amenable to successful treatment. This mainly consists in attention to the general health, and patient perseverance in the use of counter-irritation, the latter preceded by moderate local depletion.

[1] Wakley, Lancet, No. 1346, p. 631.
[2] Lancet, No. 1296, p. 10, and No. 1298, p. 64.
[3] Toynbee, Med.-Chir. Transact. vol. xxiv.

The *extremity of the Eustachian tube* may be obstructed in various ways, and deafness ensue. It may be shut up and compressed by enlarged tonsils, or by nasal polypus hanging low from the posterior nares. In such cases, deafness will disappear on removal of the tonsil or polypus.

Congestive swelling and relaxation of the fauces may cause obstruction of the tube, to be removed by astringent applications, counter-irritation, and attention to the general health.[1]

Ulceration of the fauces, implicating the extremity of the Eustachian tube, may cause more serious obstruction by the contraction which occurs on cicatrization. This is to be obviated by speedily healing the ulcer, while yet superficial and of slight extent; and is to be remedied —if possible—by the introduction of probes, or catgut bougies, whereby to effect gradual dilatation of the canal. The probe, or bougie, about six inches long, and sufficiently curved, is introduced along the floor of the nostril, with the convexity upwards; and, just before the pharynx is reached, it is gently turned so as to bring the point outwards and a little upwards—the mouth of the Eustachian tube being above the level of the floor of the nostrils. If the tube is open, the instrument will be plainly felt entering it. When obstruction or obliteration exists, pressure is to be made where the normal aperture ought to be; in the hope that thus the obstruction may be overcome. Sometimes the operation is at least partially successful. But in too many cases, this as well as the other operations on the Eustachian tube, are found to be not only difficult in performance, but also nugatory in their result.

By catheterism, as it is termed, it is proposed to rid the tube of a redundancy of mucus—another cause of deafness; but that will probably be as easily and certainly more safely accomplished, in most cases, by general treatment, gargles, and counter-irritation. In chronic affections of the membrane of the middle ear, it is possible that benefit may sometimes follow the careful injection of water, air, or medicated vapor, into that cavity; and this is accomplished by means of the metallic Eustachian catheter—introduced in the same way as the probe, and fitted with a suitable syringe. All such operations, however, must be conducted with the greatest caution; seeing that it requires but little morbid change in the bony walls of the tympanum to produce an almost direct communication between that cavity and the interior of the cranium.[2]

Organic change in the brain, or in the auditory nerve, is not an unfrequent cause of deafness; and seldom admits of successful treatment. Hopes of amendment will mainly rest on counter-irritation, and on mercurialism moderately employed.

Functional disorder of the nerve is fortunately a more frequent, as

[1] Clearness of the tube is ascertained by directing the patient to shut his mouth and nostrils, and then to expire forcibly, as if blowing his nose. He will be sensible of a click in the ear, produced by the shock of air acting on the membrana tympani, supposing this to be entire, and the sound will be very plainly heard by the surgeon, through a stethoscope placed on the mastoid process. If the tube be open, but clogged with mucus, the noise is of a gurgling or crackling kind.

[2] Toynbee, Medico-Chir. Transact. vol. xxxiv. 1851.

well as more hopeful cause; variously induced—as by blows, falls, loud noises, disorder of the general health, &c. Besides obviating the inducing cause, employing counter-irritation, and perhaps venturing on mercurialism, benefit may be obtained from the endermic use of strychnia —as in the analogous case of functional amaurosis (p. 143). Or a few drops of an alcoholic solution of strychnia may be dropped into the ear, from time to time.

Determination of blood to the head, in consequence of suppression of normal or habitual discharge, or however induced, is not unlikely to produce a certain degree of deafness, along with noises and other unpleasant sensations in the head. Treatment is by leeching or cupping, purging, and other means ordinarily found available to overcome local plethora.

Perforation of the Membrana Tympani.

This little operation is not frequently required. It is deemed advisable, when, by insuperable obstruction of the Eustachian tube, access of atmospheric air is denied to the cavity of the tympanum; and also when that cavity has become obstructed by extravasation of blood. The expediency of simple puncture, in the case of abscess of the tympanum, has been already noticed.

In cases of deafness, caused by obstruction of the Eustachian tube, it is our object not merely to make an aperture in the membrane, but to keep that pervious; and so permanently to atone for want of the accustomed atmospheric supply in the middle ear. This may be accomplished by using the instrument of Fabricci. "It consists of a canula, into which slides a spiral wire, somewhat resembling that of a corkscrew. It is to be used in the following manner: Pass the canula with the spiral wire down upon the inferior part of the membrana tympani (so as not to interfere with the manubrium of the malleus), retain it there with the left hand, being careful not to press too firmly on the membrane; then, with the right hand, take hold of the small handle which revolves the spiral wire, and turn it from right to left, being what is usually called turning the *wrong way*. The instant at which the membrane is perforated is sensibly felt by the operator. The wire is now no longer to be turned; but by its handle the instrument is to be retained in its situation; then gently revolve the canula, which has a cutting edge, from left to right, when a circular portion of the membrana tympani, corresponding to the diameter of the canula, will be cut out, and at the same time drawn into the canula and held fast by the spiral wire."[1] Or, instead of this instrument, a trocar, volute and sharp in the sides, may be employed; turning it quickly in the membrane, so as to excise the punctured portion.

Hemorrhage from the Ear.

Blood, escaping by the ear, may proceed from various sources, and requires different treatment accordingly. 1. One of the most prominent

[1] Williams on the Ear, p. 204.

symptoms of fracture at the base of the cranium is bleeding from the ear; amenable to no direct treatment; and usually an unfavorable omen (p. 58). 2. Mere laceration of the lining membrane of the meatus may furnish a copious discharge of blood; independent of any injury done to the cranium, or elsewhere. It, too, requires no direct treatment—not being likely to prove excessive. And it is not a sign of an untoward character. It may be the result of a blow, fall, or direct injury done to the part. 3. Passive hemorrhage may take place from this, as from mucous surfaces; amenable to the ordinary treatment, local and constitutional, suitable in such cases. 4. The internal carotid may have been opened into by ulceration. The hemorrhage is constant, copious, and of the arterial character. Pressure may be tried, with styptics, but may fail. The only sure remedy is ligature of the common carotid artery. 5. The lateral sinus, opened by ulceration, may be the source of bleeding—dark, and venous. In this case, while ligature of the carotid would prove wholly nugatory, moderate pressure is found to be quite effectual.

Hypertrophy of the Auricle.

Hypertrophy of the whole auricle is an occasional, though rare, occurrence. Partial hypertrophy, affecting the lobe only, is more frequently met with, and chiefly in women. If excessive and irksome to the patient from its unseemliness, the redundancy may be removed by the knife.

This deformity, however, may be artificially and intentionally produced, as by the native Indians, who wear a dagger suspended from the lobe of the ear.

Otoplastics.

Deficiencies of the auricle, by wound, ulceration, or sloughing, may be repaired by autoplasty. Restoration of the entire organ is scarcely to be attempted; but a portion may be readily replaced, when laxity of the surrounding integument is favorable, by an operation conducted on the same principle as rhinoplasty (p. 173).

Congenital Occlusion of the Meatus.

The meatus may be congenitally imperforate. It may be fully developed in all respects, but covered by integument. In such a case, simple incision of the skin, and careful dressing of the wound, so as to prevent contraction, will suffice to establish the normal state.

Or a thick fleshy covering may conceal the cartilaginous tube, which is only partially developed. And, in this case, a more careful and regular dissection may obtain a similar result, but, perhaps, more imperfectly.

Or, the external apparatus of hearing may be altogether deficient; the bone itself being imperforate. Such cases are wholly beyond the reach of our art; yet it does not follow that hearing is denied, or even

very imperfect. And of this a striking example occurred to me some years ago. A boy, aged fourteen, came from a distance, desirous of having an aperture made in each auricle; and each of these organs was found very imperfectly developed, of a shrivelled appearance, and wholly imperforate. On making a very careful dissection down to the bone, in search of an external meatus, it became apparent not only that no such tube existed, however imperfect, but that, also, there was no aperture in the temporal bone. Yet, the patient heard ordinary conversation, if distinct and rather loud; he had gone to school at the same age as other boys, and had made equal proficiency in the ordinary branches of education, although no unusual means of teaching had ever been applied to him; and he assisted his father in the occupation of a butcher, with much smartness and intelligence. A series of experiments, conducted by my colleagues, Professors Forbes and Thomson, seemed to show that he heard mainly by conduction of sound through the bones of the cranium to internal ears very perfectly constructed.[1]

Itard, Traité des Maladies de l'Oreille, Paris, 1821. Abercrombie on Diseases of the Brain, &c. Edin. 1828. Bright, Hospital Reports, vol. ii. part i. London, 1831. Kramer, on Diseases of the Ear, Berlin, 1836, translated by Bennett. Pilcher, on the Structure and Diseases of the Ear, London, 1838. Williams, on the Ear, London, 1840. Wilde, on Otorrhœa, Dublin Journal of Med. Science, Jan. 1844. Warden, Edin. Phil. Journ. Oct. 1844. Yearsley, Lancet, 1848, vol. ii. pp. 10, 64, &c. And Mr. Toynbee's various papers, Medico-Chir. Transactions, vols. xxiv. and xxxiv. Med. Gazette, July, 1843. Monthly Journal, Feb. 1849. [Also, some very good papers by Mr. Wilde, in the Dublin Journal; and a Treatise by the same gentleman, Philada. 1858.—Ed.]

---

[1] Monthly Journal, Dec. 1846, pp. 420 and 729.

CHAPTER XVIII.

AFFECTIONS OF THE NECK.

Glandular Enlargement and Abscess.

In scrofulous adolescents, the glands of the neck are very liable to enlargement, by a chronic inflammatory process; and frequently, notwithstanding every effort to the contrary, suppuration is attained to—causing more or less deformity by unseemly cicatrization. In the nascent stage, we endeavor to arrest progress; by constitutional treatment suited to the strumous diathesis; by leeching and fomentation; and subsequently, by the application of iodine, or other discutients, or by slight counter-irritation. When matter has formed, an early evacuation is practised by incision; the wound being made as minute as possible, and in the direction of the folds of the neck, so that its cicatrix may escape observation. A common lancet is the preferable instrument. Sometimes, however, the use of potass is demanded; the integuments having been much undermined, and the gland requiring disintegration (*Principles*, 3d Am. Ed. p. 213).

In the after-treatment of suppurations in the neck, cure is often delayed by over-dressing the part—covering it with too many envelops—especially when the patient is not confined to the house. The object of such dressing is to conceal the state of matters from public observation, and to guard against exposure to cold; but the result often is, to maintain a degree of congestion in the part, favorable to continued suppuration, and unsuited to contraction and consolidation of the abscess.

When abscess has formed at all deeply in the neck, whether connected or not with glandular enlargement, evacuation by incision cannot be too soon had recourse to, otherwise serious mischief can scarcely fail to ensue. Fascia is made to slough; areolar tissue is broken down; the trachea and œsophagus are each liable to be opened into by ulceration; the jugular vein may communicate with the abscess; or, still more disastrously, by communication with the carotid artery the cyst of the abscess may be converted into the sac of a false aneurism. And then, when the wound for evacuation—too long delayed—is at length made, the most serious consequences are inevitable (*Principles*, 3d Am. Ed. pp. 207, 208).

Hydrocele of the Neck.

This affection is not uncommon, and might in most cases be termed more appropriately *Hematocele;* originating in lesion of a superficial

vein, and the contents of the cyst being more or less sanguinolent. The cyst is thin, superficial, and seldom of very large size. Usually, the production of the swelling is sudden; and its progress in growth may be rapid; after a time, however, becoming stationary, and proving inconvenient mainly by its bulk. Treatment consists in tapping and injecting iodine, as in the more ordinary serous accumulations. Should this fail, a small seton may be inserted; or free incision may be practised, with subsequent granulation from the bottom of the wound.

In the necks of young children similar swellings are not unfrequently observed, altogether unconnected with blood or bloodvessels; the contents clear and albuminous.

[The term *Hydrocele of the Neck*, was originally applied by Maunoir[1] to certain tumors on the front and sides of the neck, which contain a watery fluid, bearing more or less resemblance to that found in hydrocele of the tunica vaginalis testis. This designation is not a fortunate one, for it seems to suppose an analogy or similarity of character between the two affections, when no such resemblance exists. In one case, a morbid collection of fluid, varying very much in physical properties in different instances, is formed in an abnormally developed sac; in the other, serous or sero-fibrinous fluid is effused into a normal serous cavity. A better name for the first, would be *Hygromatous Cyst of the neck*, as suggested by Von Ammon; it has also been called *Struma cystica*, *Hygroma cellulosum colli*, &c., &c.

The affection may be either *congenital* or *acquired*. Numerous instances of each variety have been witnessed and described; they resemble each other in all essential features. Tumors precisely analogous to those about to be described, occur in other situations upon the exterior of the body; they have been observed as congenital affections, on *the posterior part of the neck*, in the *axilla*, and about the *sacrum* and *perineum*; they are also found in various internal organs.[2]

Symptoms.—The *Hygromatous cyst of the neck*, or *Hydrocele of the neck*, may appear upon either side, seeming to have no preference for one rather than the other; or it may grow upon the middle of the neck, and extend laterally. When in the former situation it is found about the angle of the jaw, and extends, in proportion to its dimensions, from this point upwards towards the zygomatic arch, outwards towards the mastoid process, downwards in the direction of the shoulder and the sternum, and towards the middle of the neck. The size of the tumor varies from that of a nut to that of the child's head, or even beyond the latter, so as to occupy all the space indicated above. When upon the median part of the neck, it is usually symmetrical in its development, extending pretty equally on both sides. The median tumors are generally larger than the lateral in infants, but the reverse is the case in adults.[3] Thus Von Ammon describes and figures one upon the anterior face of the neck of an infant fourteen days old, which extended from ear to ear, covered the whole front of the neck, and reposed upon

[1] Sur les Amputations, l'Hydrocèle du cou, et l'organisation de l'Iris. Genève, 1825.

[2] Wernher, die Angeborenen Kysten-Hygrome, und die ihnen verwandten Geschwulste. Giessen, 1843, p. 2.

[3] Fleury et Marchessaux, Archives Générales de Médecine, p. 285.

the chest; the mass was so enormous, as to induce the belief that it contained a fœtus.[1] In other instances, the prominence of the tumor above the surface may be comparatively small, while it extends deeply beneath the fascia and superficial muscles of the neck. The boundaries of the tumor are well defined externally. Its connections with the neighboring tissues may be quite close and firm, so as to allow of but little mobility; or, on the other hand, it may be susceptible of being moved from side to side, and even raised up from its bed with comparative freedom.

The shape may be more or less regularly globular, pyriform, or fusiform. The tumor may be single or multiple; or, if it be single, the fluid may be contained in more than one sac, and the compartments may be so much distended as to present the appearance of many almost distinct tumors. The surface is sometimes smooth and uniform, and tense from the amount of fluid beneath; or it may present irregularities corresponding with the lobulated structure of the mass. If the integuments are sufficiently relaxed to permit a careful examination, the septa which divide the interior into separate compartments may often be distinguished, varying in number and in thickness.

The skin covering the tumor may be normal in appearance, or of a red color with varying shades of blue; in some cases, particularly in the congenital variety, it presents abundant ramifications of small blood-vessels, which become distended when the child cries, like a nævus; but, in such instances, there is no pulsation to be detected, unless from an artery beneath or near the cyst, nor is it possible to trace any vascular trunk running into the tumor, nor does the latter diminish in size under pressure. Sometimes the integuments are so much thinned from distension, and the contained fluid is so transparent, that the whole tumor, or parts of it, are translucent when viewed against a strong light, like a hydrocele of the tunica vaginalis testis.

Fluctuation can almost always be elicited by proper manipulation. It may be felt through the entire cavity, from side to side; or it may be limited in extent, and be developed only by palpation as upon an abscess, thus showing that the cavity is divided into loculi more or less distinct from each other. On the other hand, this sign may be entirely wanting, either in particular parts, or throughout the whole of the tumor; in consequence of the smallness of the individual cysts, and the consequent comparative predominance of the solid tissue composing their walls and septa, or of the absolute thickness of the latter, or of the semi-solid character of the contents of the sac.

The tumor is not, unless it be accidentally inflamed, painful, or tender on pressure; nor does it necessarily produce any constitutional disturbance. Its growth is usually slow; patients commonly state that it began as a small, circumscribed, hard swelling, and progressed slowly, until excited to more rapid progress, by some accidental exciting cause, as a blow, or pressure; or by some violent and continued straining, as in labor. But, occasionally, its appearance is sudden, and its development rapid. The amount of suffering, inconvenience, or danger induced by

[1] Die Angeborenen Chirurgischen Krankheiten, p. 18, pl. 53, of the text.

these growths, depends upon their size, situation, and rapidity of progress. If small, they produce little or no trouble; but, if large, or situated beneath the fascia and cervical muscles, they occasion pressure upon subjacent parts, interfering with deglutition and respiration, and with the circulation of blood to and from the head. Death, in fact, ordinarily results from one or all of these causes, or from intercurrent inflammation of the tumor, at varying periods, from a few days to several months after birth (*Wernher*, p. 45). And when the pressure is not sufficient to produce these effects so decidedly, it may displace the larynx, the tongue, and the cervical vessels, occupy a part of the buccal cavity, alter the voice, induce wasting of muscles, &c. &c.

Anatomical Peculiarities.—The tumor, as has been intimated, is a *multilocular cyst*, composed of one cavity, but subdivided by traversing septa, forming chambers, sometimes entirely closed, sometimes communicating; or it may be a *compound cyst*—cyst developed within cyst; or, instead of having a common involucrum, the individual cysts which form the mass, may be entirely distinct from each other, and either connected or not, externally one to another. Of the latter arrangement, a remarkable example is reported by Mr. Hawkins, who found many hundreds of such cysts in the case of a child (*Med.-Chir. Trans.* vol. xxii. p. 238).

The fluid contained within the cavity varies in different cases; it is similar to that found in other cysts of the same kind. It is very frequently a pure, limpid serum; sometimes it is gelatinous, thick and viscid, or in flakes; it may be colorless, or nearly so, or dark brown; it is frequently reddish from contained blood, and sometimes coagula of blood are found in it. *Microscopically* examined, it contains epithelial scales, blood-globules, pus-corpuscles, molecules and globules of fat, exudation granules and corpuscles, cholesterine scales; or all these may be wanting, and the fluid be perfectly homogeneous (*Wernher*, p. 32). Hydatids are also met with in the fluid. *Chemically*, it consists of water holding in solution albumen, osmazome, salts of soda, lime, and magnesia (*Wernher*).

The cyst-wall varies in thickness and density somewhat according to the size and age of the tumor, being most thin and delicate in those which are of most recent development, but acquiring additional thickness and capability of resistance as the amount of fluid increases. Studencky supposed that he could distinguish three separate laminæ; an external, composed of fibrous tissue; a middle, and an internal serous lamina (*Wernher*). Bruch carefully examined the wall of such a cyst, and found that it was formed of the integuments, entirely unaltered, either histologically or anatomically. The inner lamina is more or less vascular, sometimes very much so; thus explaining how it so often happens that the fluid found within the sac is bloody, and even contains coagula of blood; its free surface frequently presents a trabeculated appearance, like a network, the striæ being perceptible to the touch as well as the sight. In the case examined by Bruch, this arrangement was so marked that the interior of the cavity looked like the inner surface of one of the ventricles of the heart. These trabeculæ were composed of fibres of areolar tissue, with fine nuclear fibres of fibrous tissue,

such as the normal areolar tissue consists of.[1] Sometimes the surface of the lining membrane has a flocculent or shaggy appearance, compared to the cotyledons of the placenta (*Wernher*, p. 24).

Pathological Relations, Progress, &c.—The congenital hydrocele of the neck occurs sometimes in children otherwise perfectly formed and developed; in other instances, more or less important imperfections and deformities coexist with it. Wernher has studied the relations which existed between the development of the tumor and the period of utero-gestation at which birth took place, in many cases; but we need not cite the results of his investigations. After birth, these tumors have been met with at all ages, from sixteen to sixty years.[2] They affect the sexes about equally.

The progress of the case, and the changes which occur, vary in different instances. An opening may form spontaneously, particularly in the congenital variety, at one or more points of the sac, through which the fluid will escape slowly, until the cyst is completely emptied; the cavity may thus contract, and become permanently obliterated; the vestiges of its former existence will become less and less apparent; and, finally, but little evidence of it will remain. This may be true of a portion or of the whole of the tumor; the latter was the case in one of the instances reported by Wernher. A similar occurrence may take place before birth, judging from the appearance of the tumor or of some portions of it at the time of birth. The cyst, having once emptied, may refill again and again. If the sac be punctured, the same process of cure may ensue; or inflammation may follow, with varying results; or it may become inflamed without any apparent exciting cause. Again, the volume of the cyst may remain unaltered; or it may increase more or less rapidly, or diminish spontaneously. Occasionally, spontaneous opening has taken place into the cavity of the chest, and into the trachea, and œsophagus.[3] The parietes of the sac are liable to the same changes as those of other cysts; to cartilaginous, calcareous, or osseous transformation.

Nature, &c.—As regards the starting-point of hygromatous tumors of the neck, it may be from one of the glandular bodies of that region, or be entirely distinct from these. Mr. Hawkins saw them growing from the *submaxillary and parotid glands;* Redtenbacher found, in one case, the *submaxillary* and *sublingual glands* wanting, and in their place a multitude of small cysts. With regard to the connection of the *congenital* cyst with the *thyroid* gland, but little satisfactory is known; most writers on this kind of tumor, make no mention of this point; some others found the gland perfectly healthy. Bednar is the only one whom we have consulted; who states that the cyst, *in the congenital form*, is sometimes developed from the parenchyma of this body. He reports two cases of the kind;[4] in one, cited in the last-mentioned reference, a portion of the thyroid gland was removed to make room

[1] Zeitschrift fur Rationelle Medizin, vol. viii. p. 114.
[2] Fleury et Marchessaux, Archives Générales de Médecine, vol. v. 3d series, p. 284.
[3] Fleury et Marchessaux, p. 287.
[4] Die Krankheiten der Neugebornen und Sauglinge, part iii. p. 80, and part iv. pp. 80–82.

for the corresponding part of the abnormal growth. But numerous instances are recorded in which, *in adults*, the cyst was developed from the thyroid gland; several examples are adduced in the valuable essay of Fleury and Marchessaux; and of the five instances originally cited by Maunoir, two are stated to have had their nidus in this organ.

Considerable discussion has been held as to whether the cysts originate in the areolar tissue exterior to the parenchyma of the gland (the thyroid, or one of the salivary glands, as the case may be), in that which connects together the different portions of the gland structure, or by modification of the cells forming the true parenchyma. Probably, any one of these starting-points may be the true one in different cases (*Principles*, 3d Am. Ed. pp. 301–304). However this may be, the cyst, when developed in the thyroid gland, constitutes one of the varieties of *goitre*—the cystic, as this disease is ordinarily described.

In other cases they seem to originate in the *areolar tissue* of the neck, by enlargement of one or more of the areolar spaces with gradual accumulation of fluid, and modification of the tissue inclosing the cavity or cavities; or by some abnormal cell development. But an error may be committed with reference to this point; for, as M. Bednar remarks, small bodies, varying in size, and possessing a structure identical with that of the thyroid gland, but distinct, and more or less removed from it, are found on each side of it in the cellular tissue, beneath the platysma myoid muscle; so that the cyst may spring from one of these, and not from the cellular tissue itself (*op. cit.* part. iii. p. 80). In other instances, again, they form in the bursa between the hyoid bone and the thyroid cartilage, behind the platysma myoides, and the thyreohyoid muscles, as pointed out by Boyer.[1] Again, from the investigations of M. Lebert, on the intimate structure of the lymphatic glands, and from his having seen some instances in which cysts had formed within these bodies; and, moreover, from the fact that the hygromatous cysts of the neck have often been observed in the usual positions occupied by the lymphatic ganglia, so called, it seems not impossible that, occasionally, these may have been transformed into the cysts in question.[2]

The *diagnosis* of this affection is, in general, not difficult. It is to be distinguished from Ranula, Parotid tumor, chronic Abscess of the neck, affecting either the areolar tissue or the lymphatic glands; from Aneurismatic and other vascular growths; from Goitre, of which, however, it is generally made to constitute one of the forms; from Hernia bronchalis; and from the other simple and malignant tumors which appear in this region. From these it is distinguishable, by a careful investigation into the history of the case, and the determination of the presence or absence of the phenomena which characterize this and the other diseases enumerated, as detailed in this volume, or in the *Principles*. In cases of doubtful nature, the employment of a fine trocar, or an acupuncture needle, will generally settle the question.

The most reliable methods of *treatment* have been mentioned by Professor Miller.—Ed.

[1] Essay of Fleury and Marchessaux, p. 280.

[2] See Report of M. Lebert, on the details of a case of Hydrocele of the Neck, in *Mémoires de l'Académie de Chirurgie*, vol. iii. p. 45.

[The following works may be consulted on this subject: Wernher's Essay, already quoted by its title, in which is a very complete account of the congenital hydrocele of the neck, and an enumeration of authorities; Mr. Hawkins's paper, in the 22d vol. of the Med.-Chir. Transactions, in which seven cases of the same form are described; Mr. Lawrence's paper, in the 17th vol. and Mr. Phillips's, in the 25th vol. of the last-mentioned publication; Mr. Bransby Cooper, in the 1st vol. of Guy's Hospital Reports; Gooch's Surgical Works, 2d vol.; Clinical Lecture, by Dr. Mütter, in Philada. Medical Examiner, May, 1850; O'Beirne, Dublin Medical Journal, vol. vi.; and the valuable Essay, by Fleury and Marchessaux, Archives Générales de Médecine, vol. v. 3d series, which is, with reference to the acquired hydrocele of the neck, what Wernher's Memoir is to the congenital affection.—Ed.]

Tumors of the Neck.

Solid tumors, when of such a nature as not to be amenable to discussion, call loudly for an early use of the knife, otherwise each day will

Fig. 109.

Large Fibrous Tumor growing from the Neck Was successfully removed.

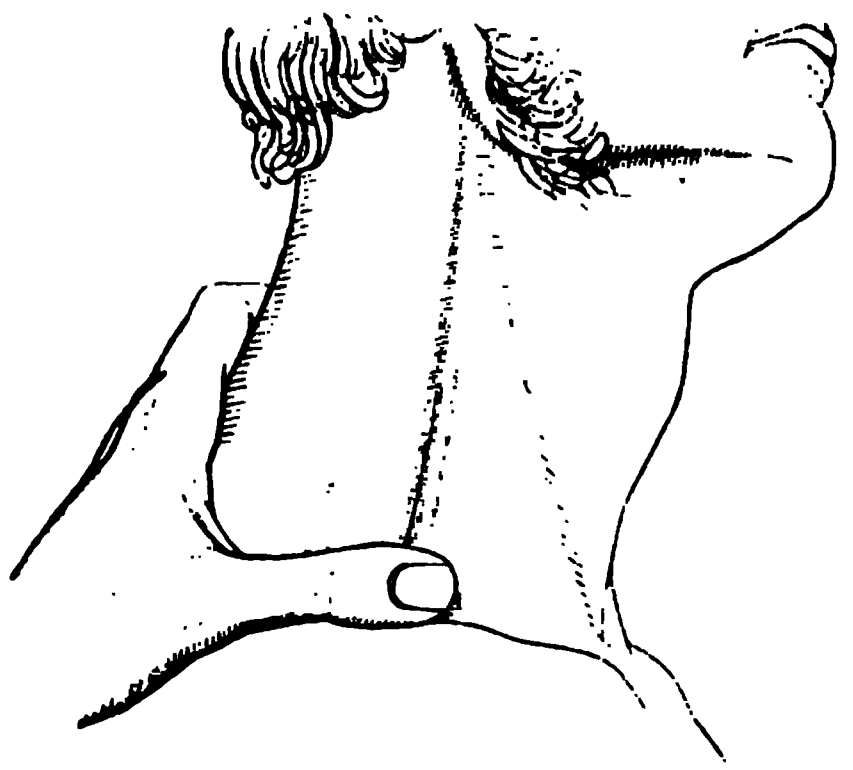
but add to the difficulty and danger of the operation; and when at last matters are found to brook no farther delay, it is not impossible, but the hazard may be found so much increased, as to render any attempt at extirpation quite unwarrantable.

In connection with this subject, it is well to remember, that in consequence of a tumor being bound firmly down by the deep and strong cervical fascia, it may seem to be less deeply seated than it is; and that consequently, much caution is always expedient in conducting the dissection, it being not at all improbable that the common sheath of the large vessels may be fully exposed—perhaps to some extent.

Opening of the External Jugular Vein.

Occasionally, it is deemed expedient to abstract blood by opening this vein at its lower part. By pressure of the thumb, applied immediately above the clavicle, prominent bulging of the vein is produced; and then an incision is made, as in venesection at the bend of the arm. The thumb's pressure is maintained, so long as the flow of blood is desired; it is then withdrawn; and this circumstance, of itself, is usually sufficient to arrest the bleeding. But, besides, it is well to place a small compress on the wound; retaining it by means of a long strip of adhesive plaster, or by a bandage very lightly applied. During the blood's flow, precaution is advisable to avoid entrance of air into the vein (*Principles*, 3d Am. Ed. p. 577).

Fig. 110.



Venesection in the Neck. The external jugular shown distended by pressure of the thumb, previously to insertion of the lancet.

Torticollis.

By this term is understood a distortion of the neck, dependent on muscular disorder—spasm, paralysis, or change of structure. The muscle usually to blame is the sterno-cleidomastoid. One, acting with the undue energy of spasm, overpowers its fellow, and displaces the neck accordingly; or one, affected with a loss of contractility, fails to afford the usual counteracting power to its fellow; or, by inflammatory action and its results, abbreviation and condensation of one or other muscle may occur, causing distortion of a very unpromising character; or the malformation is congenital.

Children, shortly after birth, are not unfrequently found to labor under a certain amount of torticollis, from the second cause; one of the muscles seeming either to have been inadequately developed, or somehow to have become partially paralyzed. Friction over the spine, and on the muscle which is weak—with care, on the part of the nurse, to exercise the faulty muscle by position of the head, yet without fatiguing the extensors—usually suffices to effect gradual but satisfactory amendment.

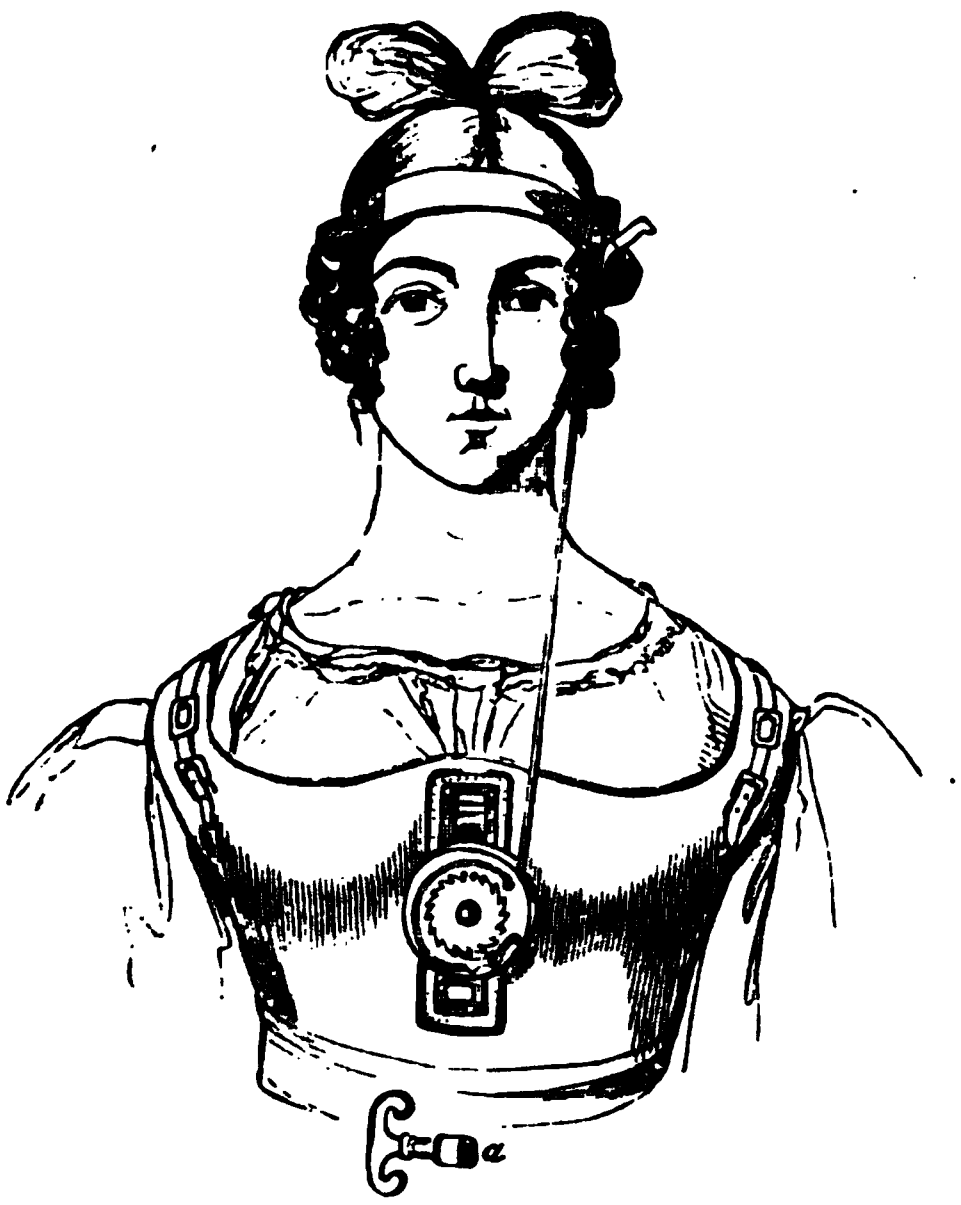
In a similar state of matters, in the adolescent or adult, the endermic use of strychnia, or the electro-magnetic stimulus, may be had recourse to.

Spasm of the muscle may be either temporary or permanent. The former most frequently occurs in children; and is to be treated by pur-

gatives and alteratives, followed by antispasmodics internally; locally by fomentation, leeching, and counter-irritation. Permanent spastic rigidity of the muscle is more common in the adolescent and adult; perhaps a remote consequence of the former affection. Mercurial friction and active counter-irritation may be tried; but with no sanguine hope of success. Sooner or later, tenotomy has to be employed; and that not merely on account of the deformity, but to avoid a more serious evil —curvature of the spine—which often supervenes, and which may, if unchecked, become both extensive and confirmed. The needle is inserted obliquely, at the origin of the muscle from the sternum and clavicle; and division is effected by cutting either from without inwards, or in the opposite direction, as circumstances may seem to require; great care being of course taken not to injure the important parts which lie immediately behind that part of the muscle. To insure safety in this respect, it may be well, in some cases, to puncture with the ordinary tenotomy-needle, or knife; and then, withdrawing this, to substitute an instrument with a probe-point wherewith to effect the muscle's section. Sometimes it may be sufficient to cut only one origin; but, usually, division of both heads is essential. By resilience of the severed extremities, restoration of the normal state is at once produced; and this is maintained by suitable bandaging, if need be, until consolidation of the divided parts occur, with the due amount of elongation.

[If sufficient force and steadiness cannot be gained by simple bandaging, Jörg's apparatus may be used. It consists of a pair of leather corsets for the chest, and a firm band to encircle the head—the two

Fig. 111.



Professor Jürg's Apparatus for Torticollis.

being connected by a steel rod; the rod is moved by a ratchet-wheel, so that the head may be inclined towards either side; the wheel is turned by a key, *a*.—ED.]

A similar operation is the only means whereby we may expect to cure the third form of the affection; that proceeding from structural change by inflammation and its results.

Twisting of the neck is caused also by tumors—glandular and others; as well as by the contraction of extensive burns. The principles of treatment in these cases are obvious.

Wounds of the Throat.

Wounds of the throat are of two classes, those inflicted by the hand of the suicide or the murderer, and those made by the surgeon. The former now engage our attention. They are usually made in a transverse direction, and high in the neck—near or at the thyroid cartilage, the latter circumstance being probably connected with the popular idea that, to effect extinction of life, it is sufficient to open the air-passage, and so cause suffocation. The extent and consequent importance of such injuries vary very much; from mere scratches, penetrating no deeper than the subcutaneous areolar tissue, to the most ghastly severing of all textures—almost to decapitation. Sometimes the incision is made immediately beneath the chin. Not unfrequently it is placed between the hyoid bone and thyroid cartilage; the mouth being opened into, and the air-passage left intact. Sometimes the weapon is drawn across, a little above the clavicle; and then, if any considerable depth be attained to, death is certain and immediate. Sometimes the knife, held as a dagger, is plunged into the lower part of the neck, to the imminent risk of the larger bloodvessels. But the region of the larynx is that which is most frequently involved.

The first danger is by hemorrhage. If the carotid and jugular have been reached, death is very speedy, and may scarcely be prevented. Such extreme wounds, however, are of comparatively rare occurrence; the vessels being protected, high in their course, by the depth of their situation in reference to the front of the neck, and by the density of the parts which have to be divided ere the sweep of the sharp edge can reach them. When, however, the deed is attempted, with a truer skill and deliberation, not by a horizontal gash, but by a puncture in the direction of the vessels, the escape of these is likely to prove rather the exception than the rule. A more limited transverse wound, leaving the carotid and jugular intact, may still cause death by hemorrhage, directly, and within a brief period; by implication of the thyroid vessels —arteries and veins. And again, a comparatively slight bleeding may prove fatal, more remotely; blood trickling into the larynx, and accumulating within the air-passage, so as to induce asphyxia; such accumulation being permitted by the insensibility of the patient, or by his inability, through faintness, to make the requisite efforts for expectoration.

The second danger is by inflammatory changes at the wounded part; occluding the laryngeal aperture, or canal, or otherwise interfering with

respiration. And this is all the more likely to occur, if the wound have been brought together tightly, with an imprudent haste. The mucous membrane, as well as the rest of the wound, becomes the seat of an acute inflammatory process; and the consequent swelling may be such as to cause rapid and great occlusion. At the same time, mucous secretion is both increased in quantity and vitiated in quality—becoming more viscid and tenacious. This accumulating in the already narrowed canal, renders suffocative hazard all the more imminent. And the risk is farther contributed to, by the diminished power of expectoration which a patient so situated necessarily possesses.

A third danger, liable to occur along with, and to aggravate that which has just been considered, is—that during the movements of the part—voluntary and involuntary—one portion of the wound is not unlikely to overlap the other, and thus, by suddenly producing a mechanical obstruction to the passage of air, at once to bring life into the greatest peril.

A fourth danger is by the occurrence of inflammatory action in the trachea and lungs; the inflammatory process extending downwards from the wound, or the unwonted direct access of cold air proving an exciting cause of original morbid action. Bronchitis, indeed, more or less severe, is almost an invariable consequence of such injuries.

A fifth danger arises from inanition, in those cases in which the gullet has suffered; and when, consequently, it is not easy to maintain a due supply of nourishment. Hectic, also, may ensue, in the case of an extensive, profusely suppurating, and slowly healing wound; more especially if much blood have been lost at the time of the infliction of the injury.

And lastly, the mental condition is, in all cases, likely to exert an untoward influence on the bodily frame. In not a few examples, when dissipation has led to the rash and guilty act, life is perilled at an early period by the occurrence of delirium tremens. Or this, indeed, may have been some time in progress, and may have caused the suicidal attempt. And in those cases which have been preceded by gloomy, brooding despondency, a continuance of low mania, accompanied with typhoid symptoms, will usually paralyze our best remedial efforts, and determine a fatal issue by sinking.

Thus it can be readily understood, how few cases in Surgery present more obstacles to satisfactory treatment than do those of cut throat. We overpass one difficulty and danger only to meet another. And, too frequently, after the most prominent evils have been skilfully counteracted, the patient slowly yet surely sinks under obscure typhoid symptoms, intimately connected with mental alienation.

Treatment.—When called to a case of cut throat, it is obviously our first duty to arrest the hemorrhage. And this is done by ligature of the arterial orifices; pressure being applied, if need be, to venous points. Then the wound is to be approximated by suture, not wholly, but in part. The angles are drawn and kept together, but the centre of the wound is left free, approximation there being effected solely by attention to position of the head, keeping the chin, by bandaging if necessary, depressed towards the sternum; and even this is not done until all

bleeding from the wound has ceased. If the chasm be at once drawn tightly together, immediate risk is greatly enhanced, as already stated; and yet this is an error very frequently committed, in the hurry of actual practice. Blood, oozing from the cut parts, does not find a ready escape externally, but either trickles into the air-passage, and accumulates stealthily there, or is infiltrated around the line of wound, causing compression of the windpipe by the increasing coagulum; in either way threatening suffocation. The viscid mucus, too, is more likely to entangle itself in the shut wound, and inflammatory turgescence is more prone to prove untoward. Air, also, is likely to be infiltrated into the areolar tissue during expiration, causing troublesome and dangerous emphysema. When, on the contrary, the wound is left entirely free, these latter risks are not only less likely to occur, but also, in the event of their occurrence, untoward tendency can be much more readily and effectually counteracted. It need scarcely be added that the dressing of the wound should be most simple; consisting, not of a complication of plaster, compress, and bandaging, but of a mere strip of lint, moistened in water, and loosely and lightly retained upon the part.

The main bleeding having been secured, and the wound partially approximated, the patient is laid on his side so as to favor outward escape of the continued oozing. And the cut part is protected from unfavorable atmospheric impression, by a covering of loose gauze, or of woollen texture, thrown lightly over the neck, attention being at the same time paid to maintain an equable and genial temperature in the apartment. Duly qualified attendants are at hand, not only to guard against repetition of the suicidal attempt, but also prepared to separate and clear the wound, should swelling and entanglement of mucus render such a proceeding necessary to prevent suffocation. And the patient should be instructed to facilitate his expectoration, by completely shutting or very much diminishing the wound, by means of his fingers at the time of the effort being made. It is hoped that the wound will granulate, contract, and cicatrize, in the ordinary way, and the local treatment is conducted with that object in view. Constitutionally, we have to guard against favoring inflammatory action in the wound, and in the air-passages, by neglect of antiphlogistic measures; and on the other hand we must beware of aggravating the tendency to sinking which sooner or later becomes apparent in the majority of cases. As a general rule, bloodletting from the system is seldom if ever warrantable.

Should the pharynx or œsophagus have been wounded, the use of a tube becomes necessary to convey nourishment to the stomach. In the ordinary effort of deglutition, the ingesta would necessarily escape more or less copiously by the wound, and so do harm in many ways. The feeding-tube cannot be inserted from the wound, although the facility of such a proceeding may invite the attempt, otherwise closure of the wound must be seriously interfered with. If intended to be introduced and worn permanently, until the pharyngeal or œsophageal aperture shall have closed, it is to be passed by the nostril. But it is found to be more expedient to introduce the tube only occasionally, by the mouth, twice or thrice daily, as circumstances may seem to require. It

is not necessary to pass the instrument completely down to the stomach; it is enough that its extremity is placed fairly beyond the wound. And of course the precaution is not neglected of ascertaining that lodgement is rightly accomplished ere fluid nourishment is begun to be introduced. One very obvious objection to the permanent retention of a tube, whether passed by the mouth or by the nose, is that its extremity, pressing against the posterior part of the windpipe, is apt to occasion ulceration there, which may perforate, complicating the case untowardly, by the establishment of tracheal fistula. Should this occur, as has happened, the ordinary test of the tube being rightly placed will probably fail; air, in expiration, escaping by the tube in the œsophagus, as well as by the natural outlet (p. 228).

Throughout the whole cure, the state of respiration must be sedulously watched. And should threatening of suffocation supervene, as is not unlikely, and prove of such a nature as not to be removed by attention to the state of the wound, tracheotomy is to be had recourse to unhesitatingly. Then, the canula being retained in the tracheal wound, the transverse aperture may be brought together, and treated so as to favor rapid union, there being no longer any risk from internal swelling or other change at that site.

Fig. 112.

"A view from behind of the larynx of a patient who some weeks previously attempted suicide, by wounding the forepart of the neck. By some mismanagement, the edges of the incision were kept asunder, and they cicatrised. The patient was seized with difficult breathing, the inspirations were rare, long, and laborious, and he had threatening of suffocation during his disturbed sleep. These symptoms were disregarded. He started up suddenly in the night, caught hold of the patient in the next bed, and fell down in a state of asphyxia, from which he could not be recovered. The œdematous swelling of the rima glottidis is remarkable; beyond that, is seen the rounded opening betwixt the thyroid cartilage and epiglottis, which last is in a normal state." (Liston, *Elements*, p. 432.)

I have often thought that in extensive transverse wounds of the neck, implicating the windpipe, however inflicted, tracheotomy may be regarded as expedient at an earlier period, that is, shortly after arrest of the hemorrhage, and partial approximation of the wound; so soon, in fact, as the patient has rallied sufficiently to bear the immediate effects of the operation. For then we should have it in our power to place and maintain the whole track of the wound in perfect apposition, and perhaps to procure union almost by the first intention. So soon as the chasm had fairly closed, the canula might be withdrawn, and the tracheal opening cautiously and gradually closed. And thus, also, should we be more likely to avoid the occurrence of fistulous tendency in the suicidal wound, which, in the ordinary progress of cure, is not unlikely to prove troublesome. In performing the operation, it will be expedient to raise and steady the windpipe, by means of a hook fixed in the lower margin of the transverse wound.

In those cases which recover, there is a risk of the larynx becoming

contracted in its caliber, so as seriously to interfere with normal respiration, and all the more probably if there be at the same time a fistulous opening established by imperfect closure of the wound. Such cases are doubtless unpromising, yet are capable of being brought to a prosperous issue. The contracted passage may be dilated by bougies passed from the mouth, and the normal capacity of the larynx having been restored, the fistulous opening may be made raw, and approximated by suture. A successful case of this nature occurred in the practice of Mr. Liston.[1]

Bronchotomy.

Under this general term are comprehended the surgical wounds of the throat, Laryngotomy and Tracheotomy, made in a longitudinal direction, artificially opening the windpipe, with some important remedial object in view. But before treating of these operations, it may be well to consider briefly the various circumstances which may demand their performance.

Foreign Bodies in the Windpipe.

Foreign bodies, held in the mouth, are apt to pass into the windpipe, during sudden inspiration, as in speaking, crying, or laughing. During inspiration the glottis is opened wide, and a foreign substance, even of considerable size, may pass readily inwards. For expiration, however, a comparatively narrow opening of the rima suffices, an aperture quite insufficient for the backward escape of the intruding substance; and, indeed, such escape is still farther opposed by the effort to produce it, which, impinging the foreign substance on the tracheal aspect of the rima, stimulates that part to spasmodic contraction.

The foreign substance may remain loose within the windpipe, moving from part to part, according to the circumstances of displacement. Or it may lodge at a particular site: 1. In the larynx, becoming entangled in the ventricles, or being of such form and size as to be impacted in the general cavity. 2. It may be similarly fixed across the trachea; pins, portions of glass, and other sharp substances, for example, have been thus impacted. 3. In either bronchus. And the right being the more directly continuous with the trachea, in that the impaction is most likely to occur. 4. Or the body, of small size, may gravitate still lower, and take up a lodgement in one or other of the bronchiæ. 5. Or it may be impacted in the very rima glottidis. Thus: a man, much intoxicated, becomes almost insensible, and is sick. The contents of the stomach are lazily evacuated upwards, and a portion of the ingesta may enter the rima and remain there, causing suffocation. A piece of potato-skin has thus proved fatal. Or again, large substances held in the mouth and forced downwards in sudden inspiration, may prove too bulky to pass through the rima, and become impacted there, inevitably causing suffocation, unless instant relief be obtained, either at the hand of surgery, or by the patient's own expulsive efforts. And in such a

[1] Liston's Elements, p. 435.

case, unless the tightness of impaction be great, success is more likely to follow the instinctive throes, than in the case of smaller bodies within the larynx, spasm of the glottis being mechanically prevented, and consequently proving no obstruction.

The symptoms denoting the occurrence of such accidents are, in general, tolerably distinct. If impaction have taken place in the rima, the symptoms are those of rapid asphyxia; the patient suddenly exhibiting the greatest distress, becoming livid and swollen in the countenance, staring with bursting eyeballs, gasping anxiously, struggling for breath, and speedily becoming insensible. When the foreign body has passed within the rima, the symptoms vary according to the site and nature of the lodgement; but, in all cases, they evince two leading characteristics—denoting obstruction to respiration, and irritation produced in the part with which the substance is in contact. If it be loose in the windpipe, or lodged in the larynx or upper part of the trachea, the following are the ordinary symptoms. A violent fit of suffocative cough immediately succeeds the entrance of the foreign body—seeming to cease, it is probable, only on Nature having been wholly exhausted. And, at short intervals, such paroxysms are renewed; more particularly, if any new movement of the foreign body have occurred. Inspiration is loud, strained, and of a harsh, croupy, or sawing sound. The voice is changed. Pain is complained of in the part. A more or less copious expectoration of mucus takes place; and sometimes of blood. The countenance is suffused, and expressive of great anxiety—an expression almost pathognomonic, especially in the young. And the neck is stretched, with the head elevated and thrown back, in the position of orthopnœa. Often, all the auxiliary muscles of respiration are found in full play. It is right to remember, however, that in some cases—more especially when a considerable period has elapsed since the occurrence of the accident—the intervals between the paroxysms may be passed in comparative quiet, with an almost total absence of symptoms at that time. When impaction has taken place in a bronchus, a characteristic sign is indicated by auscultation—suppression of respiratory sound on that side, with puerile respiration in the opposite organ. The respiratory movements of the parietes of the chest, too, are diminished or arrested in the obstructed part. Or a still more plain indication may be afforded, if the substance happen to be of musical capability, however rude, and so situated that the air passing by it in respiration may evoke its powers of sound. Rough substances soon occasion purulent discharge, which possesses great and characteristic fetor. Sometimes the foreign body, when smooth and loose, may be felt distinctly impinging against the upper part of the larynx, during a convulsive effort at extrusion.

The affection with which this accident is most apt to be confounded, is rapid obstruction of the upper part of the windpipe by inflammatory action. But the history of the two cases must necessarily be very different; urgent symptoms being in the one case immediate, unaccompanied with febrile excitement of the system, and often most intense at first; while in the other they are more or less gradual in their accession, of a crescent character, and invariably attended with inflammatory

fever. Also, in the accident, expiration is difficult, while inspiration is comparatively easy; whereas, in the disease, the precisely opposite condition obtains.

That in all cases there is a necessity for the speedy adoption of measures calculated to effect removal of the foreign body, is tolerably plain. Otherwise, the risks to life will be neither few nor slight. 1. Sudden suffocation may occur, at a very early period, by impaction of the substance in the upper part of the larynx—as already shown. 2. Imperfect respiration may more gradually induce a fatal issue; in consequence of partial obstruction caused by the foreign body, and accumulation of mucus at the incommoded part. 3. Laryngitis or tracheitis may be excited, of formidable character. 4. Congestion may take place in the lungs; followed perhaps by apoplectic disruption of the pulmonary tissue, or by pneumonia, or by bronchitis. 5. A foreign body of small size may perforate a bronchus or bronchial tube, and lodge in the pulmonary tissue; and acting untowardly there, as all foreign substances must, may cause abscess, or lay the foundation for tubercular deposit and fatal phthisis. 6. Or the passage outwards may be more advanced. The lungs may be passed through, and the cavity of the pleura reached; and empyema may be the result. No doubt it has happened that yet another step has been taken; the foreign substance has perforated the walls of the chest by tedious ulceration, and been discharged externally. And it has also happened that a foreign body has been expectorated by the mouth, along with purulent matter, at a long date from its introduction. But such occurrences are much too rare to warrant their use as precedents in determining the appropriate treatment.

If the violent efforts of the patient fail to dislodge and extrude the foreign body—as is not unlikely—recourse must be had to bronchotomy; and through the artificial opening in the windpipe the foreign body is sought to be extracted. Before proceeding to this operation, however, it is well, in cases of comparative obscurity, to explore the pharynx and gullet, in the first instance. Urgent symptoms of dyspnœa, we have already seen, may be caused by foreign substances lodged in either of these passages; thence compressing, irritating, and obstructing the air-passage. And experience has shown that a foreign body, not bulky enough to cause dangerous compression, may lodge near the rima, and exterior to it; may cause many of the ordinary symptoms of a foreign body within the windpipe; and that in such a case, while bronchotomy must necessarily fail, expulsive efforts, duly aided by the surgeon, are most likely to succeed.[1]

When the foreign body is of small size, and plainly indicated by the symptoms to be either loose in the air-passage or fixed in the upper part of the larynx, laryngotomy may be had recourse to. It is of easy performance; and, though an aperture through the crico-thyroid space be necessarily of limited dimensions, it is probable that through that space such a foreign body may be readily enough removed. In all other cases, however, tracheotomy, though a more troublesome operation, is, for obvious reasons, to be preferred; the aperture is more free, and

[1] Lancet, 1069, p. 729.

the facilities for extraction, both from below and from above the opening, are manifestly greater.

When the foreign substance is loose, it is usually expelled forcibly by the outward current of air, so soon as the operation is completed. But if fixed, it must be sought for, and removed artificially. If lodged above the opening, a common probe is the most convenient instrument for exploration. By it the site is detected; by it the foreign body may be pushed through the rima—to be coughed up; or loosening is effected, with subsequent expulsion through the tracheal wound. When the site of lodgement is in the bronchus, long-curved forceps—such as recommended for extraction of foreign matter from the pharynx and œsophagus (p. 232)—are very suitable for both exploration and extraction. Auscultation and percussion having previously imparted to the operator a shrewd suspicion of the site of lodgement, the instrument is passed down shut, and made if possible to impinge on the foreign substance; then, slightly withdrawn, the blades are opened; and, pushing on again gently, the object is probably grasped; if not, the other forceps—opening in an opposite direction—is similarly employed, with almost a certainty of success. The wound is kept open until bleeding has ceased; it is then brought accurately together by adhesive plaster, and adhesion hoped for.

But the air-passage may prove intolerant of the forceps; and perseverance in their use, searching for a foreign body, might peril life by violent paroxysms of dyspnœa.[1] In such cases, modern experience has pointed out a safer mode of procedure[2]—more especially if the foreign body be of some weight, as a stone, coin, or any piece of metal. The tracheal wound being kept open, let the patient's body be inverted, so as to make the head dependent; and, if need be, let succussion of the frame be had recourse to, so as to favor dislodgement of the offending substance, and its descent towards the larynx by gravitation. Arrived at the rima, it will not find its outward passage there obstructed by spasm, nor will a paroxysm of dyspnœa be induced; for, the opening in the trachea has the effect of obviating this difficulty and danger. Escape is made readily into the mouth, and thus extrusion is effected with both ease and safety.

It has been proposed to supersede bronchotomy altogether, by the preceding manœuvre. But such a proposal does not seem to be a prudent one. In most cases the attempt would probably fail, and life be imminently perilled, the foreign body being obstructed by spasm at the rima, and, perhaps, becoming impacted there. The proceeding is suitable only when the foreign body is small, smooth, and of high specific gravity; and seems to be in all respects safe, only when a tracheal aperture has previously been established; and when, in consequence, irritability of the rima has been assuaged, and accident by impaction

[1] In using the forceps, anæsthesia is obviously calculated to prove of much service; rendering exploration both easy and safe. In applying the chloroform, it will be necessary to place it over the wound as well as on the mouth. See a case by Dr. Johnston, of Montrose, *Lancet*, No. 1478, p. 600.

[2] Lancet, 1068, p. 502.

there fully provided against. A case or two of accidental success,[1] will not suffice to overthrow the general principle here inculcated.

It may happen that some considerable time—weeks or months—has elapsed since introduction of the foreign body, before aid is requested. Such lapse of time need not deter the surgeon from operating, if other circumstances prove favorable; for experience has shown that removal of the offending matter, even at a distant date, may be sufficient to avert all serious ulterior consequences.[2]

Asphyxia.

In attempting resuscitation from asphyxia, it is necessary to maintain artificial respiration; and this is effected, in ordinary cases, by insufflation of air through the mouth or nostrils (*Principles*, 3d Am. Ed. p. 694). But were the rima glottidis spasmodically closed, such ordinary means would be likely to inflate the stomach only, leaving the lungs unaffected. Under such circumstances, therefore, one of two proceedings is necessary; to pass a tube into the windpipe from the mouth, or to perform bronchotomy. The operation of passing a tracheal tube is always difficult, and becomes especially so, even in an insensible patient, if the rima be closely shut, as in the case of suffocation by carbonic acid. It can readily be understood, therefore, how, in many cases, such an attempt is well superseded by the operation. Usually, laryngotomy will suffice. One caution must be particularly attended to, namely, to prevent blood from entering by the wound, and accumulating in the air-passages. And should such entrance have been effected, means should be taken, by suction applied to the wound, to accomplish its expulsion.

In cases of *suspension* by the neck, it is plain that bronchotomy cannot avert a serious result, and may, probably, fail in the attempt at resuscitation; for the cause of death is not from constriction of the windpipe only, but by concussion of the brain and spinal cord, and by interference with the jugular circulation. And these latter circumstances may, of themselves, be sufficient to produce a fatal issue, independently of direct interference with respiration. Seldom does any displacement occur in the cervical vertebræ.

Injuries of the Larynx.

A blow on the larynx may directly peril life by arresting respiration. The rima glottidis may be wholly shut, either by spasm of the occluding muscles, or by paralysis of their antagonists—more probably by paralysis of all the muscles concerned; or it may be but partially occluded, yet with such a tumult and difficulty of respiration as to render the case one of great and immediate hazard. And, under such circumstances, it is plain that the only prospect of relief is by tracheotomy—opening

[1] Northern Journal, Feb. 1845, p. 220.

[2] London and Edinburgh Medical Journal, August, 1842, p. 722; and Liston's Practical Surgery, p. 371.

the windpipe below the injured part; the aperture being kept patulous, until the organ has recovered, and is able to resume its wonted functions in normal respiration.

Rupture of the trachea, by external injury, may prove fatal, by rapid and extensive emphysema; the pressure of this producing asphyxia more or less rapidly. By making many and early punctures in the affected part—or by incision—we may give an outward escape to the air, and so avert the threatened disaster.

Apoplexy of the larynx may occur; blood being infiltrated copiously beneath the mucous membrane. Symptoms may be urgent, simulating croup or œdema glottidis, and so threatening asphyxia as to render relief by bronchotomy inevitable.[1]

The *thyroid cartilage*, ossified, may be fractured by external violence, and serious consequences ensue; requiring active antiphlogistics, and perhaps tracheotomy eventually.

The accidental swallowing of Boiling Water, Acids, or other Irritant Fluids.

It is common among the poorer classes, in some localities, to have but one vessel, a large kettle, to hold water for culinary purposes—sometimes cold, at other times hot, according to circumstances. A child, accustomed to have its thirst assuaged from such a source, is likely to help itself, when no one else is near; and, in doing so, may unhappily fill its mouth with fluid of a boiling temperature. Instantly an attempt is made by the little sufferer to eject the fluid; and in the backward movement of the hot water, partial entrance into the open rima glottidis is not unlikely to occur, during the expulsive paroxysm. The result is a scalding of the air-passage, as well as of the pharynx and upper part of the œsophagus; and by swelling in the former situation, during the subsequent inflammatory process, the most serious results may ensue.

Adults may swallow acids or other acrid fluids, either by accident, or intentionally. In the latter case, the air-passage is seldom injured. The determination to the act of swallowing shuts the glottis, and the fluid passes downwards in the gullet alone. But if a patient accidentally attempt to swallow a fluid of this kind, mistaking it for some other of a harmless nature, the expulsive effort is instantly made—as in the case of the child with hot water; the glottis is opened in the paroxysm, and the noxious fluid effects a partial entrance there.

The treatment of such cases requires to be conducted with an energy proportioned to the urgency of their nature. The inflammatory process may not be prevented; but it should be our anxious endeavor to moderate and delay its onset, and to effect its speedy retrocession. The most active antiphlogistics are employed—immediately; bleeding from both part and system; outward fomentation; antimony. It may be that, by such means, the progress of inflammatory tumescence may be restrained, so as not to affect respiration urgently, and that extension of

[1] Monthly Journal, August, 1847, p. 126.

inflammatory action from the parts first involved to the air-passages in general, may be prevented. If, however, antiphlogistics fail, and asphyxia threaten by obstruction in the larynx, tracheotomy is to be had recourse to at once; not reserving the operation, especially in the child, until by extreme urgency of the symptoms it cannot possibly be longer delayed, and when recovery is rendered more than problematical by congestion in the brain, in the lungs, or in both. Laryngotomy is plainly unsuitable; to practise that would be to cut into the affected part, and to fulfil very imperfectly, if at all, the object of the operation. The wound of tracheotomy, on the other hand, is below the seat of disease, the affected part is put at rest, life is saved from asphyxia, and the inflaming larynx, by being allowed quietude, is powerfully aided in the resolutory effort. On decadence of the inflammatory process, and when absorption, clearing away all swelling, has restored the normal state of the organ, the tube is withdrawn, and the wound permitted to close.

Spasm of the Glottis.

It has been already stated how bronchotomy may be highly available in the case of spasmodic closure of the glottis, threatening asphyxia; as in poisoning by carbonic acid.

Laryngismus stridulus, a spasmodic affection of the windpipe, not uncommon in children, and occasionally met with in the adult, may, in its paroxysms, threaten suffocation; and, in such circumstances, the question of the expediency of bronchotomy comes to be entertained. In general, the operation is to be withheld, unless the circumstances prove extremely urgent; and it is then employed as a means of palliation and protraction, rather than of cure. And more especially will the prognosis be guarded and unfavorable, if there be reason to believe that the spasmodic attacks are dependent on irritation produced by structural change at a low part of the windpipe; as by enlargement of the thymus gland, affection of the bronchial glands, aneurism, or formation of other tumor. In one form of aortic aneurism, when the tumor is small, and does not compress and contract the air-passage, but acts on the larynx irritatingly by implication of the recurrent nerve, causing suffocative paroxysms of spasm in the glottis, it seems very proper to have recourse to tracheotomy early, with a certain hope of relief, and a prospect of even something more than mere palliation. But when the tumor is large, compressing and contracting the air-passage, and causing continuous dyspnœa, the prospect is not so favorable, and the grounds for operation are scarcely sufficient, probably, to warrant its performance.[1]

It were out of place, in such a work as this, to enter fully into the various interesting and important affections of the windpipe. But it is right to notice them briefly, in connection with the operation of bronchotomy; the leading features only being stated.

[1] Monthly Journal, Aug. 1851, p. 185.

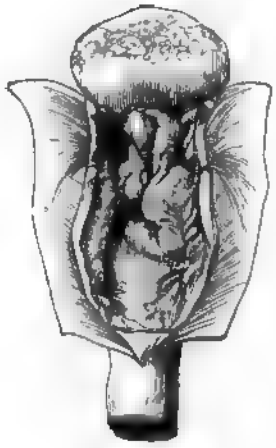
Laryngitis.

The inflammatory process, occurring in the larynx, may be either chronic or acute.

I. Acute Laryngitis. *a. Laryngitis simplex.*—There is, in this affection, more or less turgescence of the mucous membrane, with the accustomed change of secretion—the results of a minor amount of the inflammatory process; but the swelling is diffused uniformly, and not at any part great, and the secretion is not liable to be retained and accumulated; no paroxysm of dyspnœa threatening suffocation is likely to be caused by such changes; and, consequently, in this affection the direct interference of surgery, by bronchotomy, is not required. Medical treatment suffices.

b. Laryngitis œdematosa.—This is the acute *œdema glottidis;* an inflammatory process attacking the larynx and rapidly causing much bulging of the lining membrane by serous and fibrinous infiltration of the submucous tissue; active congestion being rapidly reached, and persisting of high intensity (*Principles*, 3d Am. Ed. pp. 111 and 119). In consequence of such change, the characteristic symptoms are soon developed; increasing dyspnœa, liable to paroxysmal exacerbation; inspiration protracted, labored, stridulous; expiration comparatively easy and silent; anxiety of countenance, &c. And, besides, there is ultimately afforded to the surgeon a more plain indication; inasmuch as the œdematous swelling may be felt, on the epiglottis and glottis, by the finger introduced from the mouth; and may even be seen, on depressing the tongue forcibly by the speculum. Practically, the disease may be divided into three stages: 1. There is the condition of laryngitis simplex; while the action has not proceeded beyond turgescence, and when there is no obstruction to breathing. But this state is quickly overpassed, in most cases. 2. The characteristic œdematous swelling is forming; not diffused and uniform, but mainly affecting the glottis and its immediate neighborhood, and causing prominent bulging there. Respiration is now more or less impeded; and obstruction is on the increase. 3. Breathing having been for some time seriously interfered with, and aeration of the blood imperfectly performed, untoward results begin to manifest themselves in both lungs and brain—congestion, followed by serous effusion; the threatening of asphyxia is aggravated by threatened supervention of coma. Most frequently the obvious cause of death is by the former event; obstruction by mucous swelling becoming greatly augmented by accumulation of viscid mucous secretion, a paroxysm of dyspnœa is induced; in the tumultuous disorder of respiration that ensues, it is not improbable that the patient may drop as-

Fig. 113.



Acute Œdema Glottidis; exposed from behind.

phyxiated; and recovery from that state will be seriously affected by the cerebral change already in progress. In other cases, the fatal issue is more gradual; asphyxia steadily advancing, without paroxysmal aggravation.

The suitable treatment is active throughout. At first, ordinary antiphlogistics are plied industriously; bloodletting, antimony, calomel, and opium. These may arrest the affection in its first stage. If not, let them be persevered with; for they may yet mitigate the swelling, prevent the occurrence of urgent symptoms, and procure a favorable resolution from the second or characteristic stage, without life having been ever seriously endangered by threatened asphyxia. In this stage, however, be it remembered, bloodletting must be had recourse to with very considerable caution; it being well known, from experience, that there is an intolerance of this remedy, heroically employed, in all cases in which respiration is seriously obstructed. Let mercury take the place of loss of blood; and by it, judiciously employed, let us hope to limit deposit and promote absorption successfully, and thus to make a satisfactory impression on the œdematous bulging. Not seldom, marked benefit will follow free scarification of the epiglottis and lips of the glottis, by means of a curved knife; the tongue being fully depressed by the mouth-speculum, so as to render these parts accessible to such procedure. Should, however, resolution fail to follow on the use of such means—the symptoms proving both crescent and grave—let bronchotomy be at once had recourse to; regarding the operation as truly a part of the remedial treatment, whereby the peril of extreme urgency may be avoided, not as a last resource whereby a life half lost may only perhaps be regained. Tracheotomy is plainly to be preferred; for thus only can we place the artificial opening beneath the seat of obstruction so as to effectually avert the immediate danger by impending asphyxia; and thus only can we fulfil the very important indication of placing the affected part in the state of comparative quietude and repose, so suited for facilitating resolution and recovery. The medical treatment is not interrupted meanwhile. In due time it tells favorably on the swelling. This begins to subside; and then the use of the tube may be begun to be discontinued, introducing it only occasionally. Ultimately the part recovers itself wholly as to swelling; and then, the tube having been finally withdrawn, the wound is approximated and encouraged to heal. During the first hours of the tube's use, great care is necessary in keeping the aperture clear; viscid mucus is being copiously secreted; the power of expectoration being very weak, occlusion of the artificial rima is apt to ensue; and such risk by sudden asphyxia is all the more likely to occur, if the patient have fallen asleep shortly after performance of the operation—as often happens. More than one day and night may have been passed in sleepless anxiety, pain, and distress; and the relief at once experienced, after the first effects of the tube's introduction have passed away, is apt to lull the relieved sufferer into a deep and unconscious slumber—from which it were hard to be awakened, abruptly, only to perish by suffocation. The attention of a qualified attendant must be constant, to maintain clearness of the tube, until the excessive secretion of mucus has diminished, and the power of expectoration been regained.

In this affection, then, let tracheotomy be had recourse to, so soon as it is plain that medical treatment has failed to effect timeous resolution. Do not delay, until both lungs and brain have been so far involved as to render recovery under any treatment at that stage more than doubtful.

c. Laryngitis fibrinosa is usually combined with a corresponding morbid state of the trachea—tracheitis fibrinosa—constituting *croup*. This, too, may be conveniently divided into three stages: 1. Again the laryngitis simplex, but of greater intensity than in the previous case, and with a marked tendency to spread along the mucous membrane downwards. 2. The fibrinous exudation begun; aggravating all the symptoms, and affording serious obstruction to breathing. 3. The lungs and brain implicated, as in the former case, by reason of the continuance of impeded respiration. The former organs, however, in this case, are exposed to an additional source of danger. The inflammatory action, by continuous extension, may have reached the bronchial ramifications; and to the oppression of the lungs' play, otherwise occasioned, the additional and serious complication of bronchitis may be added.

In the first stage, medical treatment is practised, as in the corresponding period of the previous affection. There is no demand for bronchotomy, on account of urgency of symptoms connected with respiration; and the spreading acute inflammatory action is not likely to be limited, in either its extent or intensity, by the infliction of a tracheal wound, and retention of a foreign body therein. In the second stage, the symptoms are sufficiently urgent to call for any aid which our art can afford. Tracheotomy will give a more direct and free entrance for air passing towards the lungs, than through the affected larynx; and the larynx will be placed in a state of comparative rest, favorable to recovery. But the same good result does not follow as in the case of acute œdema glottidis. The disease is not limited to the larynx, but has passed the site of tracheal wound, and is already established too, probably, in the bronchial tubes; the wound is made—not in a comparatively sound part, to afford rest to the superior portion of the canal—but in the midst of the disease, affording rest to but a part, and a minor part, of the disorder's seat, and inducing, by its additional stimulus, an aggravation of the whole. Air is let in towards the lungs, but with only a doubtful chance of reaching them; for, by this time, the bronchial tubes are clogged with viscid mucus, the bronchial membrane is itself swollen and infiltrated, the trachea is more or less obstructed by false membrane, and, perhaps, indeed, pseudo-membranous exudation has extended throughout almost the whole bronchial ramifications. Thus, the salutary indications are not fulfilled, and the operation fails of its expected issue. In the third stage, surgical interference must prove still more manifestly hopeless. In this disease, therefore, the practical inference

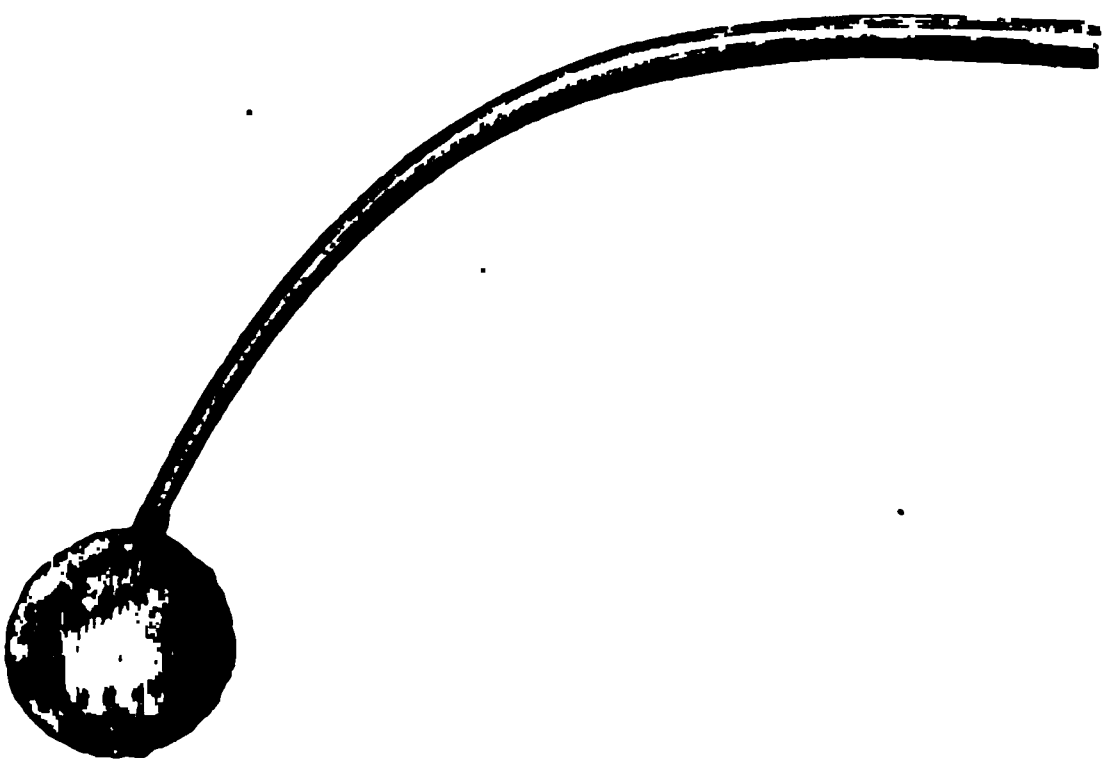
Fig. 114.

Example of False Membrane in Croup. Its evil consequences very apparent.

from such considerations will be, that our principal confidence must be placed in medical treatment; that the operation of tracheotomy—laryngotomy being, in all respects, obviously unsuitable—cannot be expected to prove of either great or frequent service; but that if it be had recourse to, it should be during the second stage, when plainly medical treatment has failed to arrest or mitigate, and before the third stage has set in; rendering recovery, under any circumstances, all but absolutely hopeless. Recourse to the operation may be regarded, therefore, as the exception rather than the general rule.[1]

An operation of a simpler kind, and sometimes productive of benefit, has lately been advocated by Dr. Green, of New York, and others, namely, the direct application of nitrate of silver, in strong solution, to the affected part. By means of a powerful spatula, the tongue is depressed and brought forwards; a bent piece of whalebone, tipped with sponge, and soaked in the solution (from two to four scruples of the salt to the ounce of distilled water) is passed behind the epiglottis, and then

Fig. 115.



End of the Sponge-Probang, for the Larynx; the sponge always carefully affixed to whalebone not made brittle by the caustic.

suddenly forced on into the larnyx. The effect is twofold; mechanical clearance of the canal, the sponge withdrawing much mucus and exudation, and the nitrate exciting a curative influence on the affected membrane. At first, the presence of the foreign body is resented by unpleasant spasm and irritation; but these soon subside, and the operation may be repeated at such intervals as circumstances may seem to require.

But there are cases of *true* laryngitis fibrinosa, in which the action is

[1] I am quite aware that authority is not wanting to enforce an opposite practice; Trousseau and Bretonneau, for example, warmly advocating the performance of tracheotomy in croup, and supporting their doctrine by an array of successful cases (*Brit. and For. Rev.* No. 23, p. 110). But, on this point, the question always obtrudes itself: Were these cases all examples of true croup? for it is well known how loosely medical nomenclature is often applied; and as, by some, all sores on the penis are called chancres, all hard swellings on the breast dignified by the appellation of scirrhus, every bleeding fungus called fungus hematodes, so may all acute affections of the larynx be arranged under the general denomination of croup.

mainly limited, and the pseudo-membranous exudation entirely confined to the larynx itself. These are few, certainly, compared with the ordinary examples of croup; still they do occur, and may be diagnosed by the absence of tracheal and pulmonary symptoms, and by the apparent concentration of laryngeal disorder. In such cases, if other treatment fail in the second stage, and symptoms are urgent, tracheotomy should be unhesitatingly practised, on precisely the same grounds as in acute œdema, and, probably, with the same fortunate result.

Diphtheritis, or *cynanche membranacea*, may be said to be a variety of laryngitis fibrinosa. The aphthous exudation, however, and the action which causes it, do not originate in the larynx, but in the mouth and fauces, thence spreading rapidly downwards. The lungs, through the bronchial ramifications, are early involved, and cannot possibly be relieved by a tracheal wound. Bronchotomy, therefore, is, in this affection, inadmissible.

d. Laryngitis purulenta.[1]—In this, the inflammatory process is more advanced than in any of the preceding forms of acute laryngitis; true inflammation is reached, and its characteristic product exhibited. Fortunately, such a result is of comparatively rare occurrence; and, fortunately, also, when it does occur, the action is usually confined to the upper part of the larynx, and corresponding portion of the fauces. The matter is not limited in the form of abscess, but is diffusely infiltrated into the submucous areolar tissue. The membrane gives way, the matter is discharged, and an ulcerated surface remains. The symptoms and progress are very similar to those of acute œdema. And the treatment is to be guided by precisely the same principles. By medical treatment, we hope to arrest the action in time to avert peril to life. If not, and dyspnœa increase threateningly, tracheotomy is to be performed, early, in the second stage, as a *part* of the remedial treatment. The prognosis is favorable—as in œdema, when timeously relieved.

Acute ulceration of the larynx may result from this affection, as already stated; almost certain to be attended with more or less swelling; and, consequently, requiring the same surgical aid as the acute œdema glottidis.

II. CHRONIC LARYNGITIS.—This may be the result of an acute or subacute attack; more frequently it is chronic from the first. But, however originating, it is ever liable to sudden and acute aggravation, from comparatively slight causes; bringing life into peril, all the more imminently on account of the insidious and comparatively mild nature of the previous symptoms.

a. Thickening of the Mucous Membrane, resulting from what may be termed simple chronic laryngitis, usually gives way to remedial treatment alone; leeches, counter-irritation, mercury, and other alteratives. Should an acute accession supervene—and to such the patient is constantly liable—obstruction to respiration may be speedily induced, threatening the most serious consequences. Under such circumstances, proportional augmentation of the medical treatment may fail to relieve; and then tracheotomy comes to be required.

[1] London Medical Gazette, January 12, 1833.

As a general rule, when counter-irritation is employed in any affection of the larynx, it should be applied either laterally, or on the back of the neck, not in front; for the remedial effect is the same; and it is obviously expedient to leave the site of tracheotomy clear and available, in the event of recourse to that operation becoming necessary.

b. Follicular disease of the larynx is an affection of great frequency, the morbid action being resident and in most cases originating in the mucous follicles. These are seen on the back of the pharynx, in various stages and forms of alteration by disease, hypertrophied, vesicular, pustular, ulcerated, and the presence of similar change within the larynx is marked by characteristic symptoms, cough, expectoration, hoarseness of voice, &c. If permitted to advance, the consequences are serious; loss of voice, increase of structural change in the air-passages, and impairment of the general health. Treatment consists in rest of the parts, application of the nitrate of silver, in the manner already described (p. 268), both to the fauces and within the larynx, and alteratives internally, according to circumstances, arsenic, iodide of iron, Donovan's liquor, &c.

c. Chronic Œdema glottidis.—This affection is more gradual and less marked than the acute form, but is not less dangerous, being liable to sudden and great exacerbation. The œdema is gradually formed, of more solid consistence, and more uniformly diffused. But from slight exposure to cold, error in diet, or other casualty, acute accession is very prone to supervene, speedily blocking up the passage, and causing the most distressing and dangerous dyspnœa, partly by acute swelling, partly by entanglement of viscid mucus, partly by spasmodic or otherwise disordered action of the muscles of the larynx. Sometimes, without any apparent source of aggravation, a fit of dyspnœa suddenly occurs, dependent, probably, on the last-mentioned cause, spasm. Such a patient is never secure. One moment he may be walking abroad, conversing, or otherwise enjoying life with tolerable comfort, the next he may be prostrate, livid, and struggling for existence. A fatal result, however, seldom follows the first of such seizures. Minor attacks usually precede the fatal event.

The duty of the practitioner is, by suitable treatment, to arrest the sluggish action, to undo the change of structure, and to restore tone to the enfeebled system, and by every care to provide against the application of such causes as are likely to induce aggravation. Should such aggravation occur, he must be on the alert. Medical treatment is continued, with redoubled care and anxiety, and the patient is closely watched. If the treatment prove unsatisfactory, fits of dyspnœa continuing to recur, tracheotomy is certainly to be performed. Thus only can the tenure of life be rendered at all secure in such cases; and then, too, the other remedial means may be expected to have a more salutary effect on the original disease, as in the case of simple thickening. After some time, the tube may be withdrawn, and the wound closed. However, prognosis as to discontinuance of the tube is not so favorable as in the acute form. Resolution may be slow and imperfect, the part may never wholly regain its normal state; perhaps respiration cannot

be restored through the normal passages, and the tube consequently may require to be worn during the remainder of life.

d. Ulceration of the Larynx.—The larynx is liable to ulceration of different kinds, the result usually of chronic inflammatory action: 1. *Simple ulceration* may occur as a direct result of chronic laryngitis, or of follicular disease; or the larynx may be implicated secondarily by extension of ulceration from the fauces, as is not unlikely to happen in patients who have the misfortune to labor under an aggravated form of mercurio-syphilis. The ulceration is very liable to be surrounded by œdematous swelling, which, by obstructing respiration, seriously complicates the case, and may demand both instant and energetic measures to save life. And such complication is especially apt to occur, if by exposure or other cause an inflammatory aggravation have supervened on the previously chronic form. Or the amount of œdema may be slight, respiration may never be seriously impeded, the ulcer may heal, and the normal caliber and function of the larynx may be almost wholly restored. Or, on cicatrization, long delayed, contraction and displacement of the parts are such as permanently to interfere most seriously with both voice and respiration.

Treatment consists in constitutional alteratives, suitable regimen, careful protection from all sources of aggravation, patient continuance of moderate counter-irritation, and regulated use of nitrate of silver to the affected part; and thus we hope to effect cicatrization ere dangerous loss of substance has occurred—to effect, in short, something like actual resolution. If œdema supervene, and life be threatened by paroxysmal dyspnœa, tracheotomy is imperatively demanded, and must be performed. At this juncture, it is indispensable to the preservation of life. But it comes to be a question, whether its earlier employment may not be expedient, not to save life directly, but to save structure, by placing the larynx at rest, and so facilitating the action of remedial means, accelerating cicatrization while ulceration is yet both limited and superficial, and thus preserving unimpaired the important function of the organ. I would incline to the opinion that it is expedient to have recourse to tracheotomy, and temporary use of the tube, in those cases of simple ulcer of the larynx which threaten to resist ordinary remedial means, and which, by loss of substance, endanger the function of the part, operating before life has been threatened by intercurrent œdema, when there is soreness on pressure of the thyroid cartilage, when pain is felt acutely, on the box of the larynx being rubbed laterally across the spine, when there is a sensation of rawness and soreness in the part complained of by the patient; when there is decided and peculiar fetor in the breath, with pain and difficulty in swallowing, cough, and purulent sputa—occasionally streaked with blood; and when these symptoms persist unsubdued. By the operation, the diseased part is put at rest; counter-irritation, and alterative treatment will have a much more powerful and salutary influence; and besides, an additional opportunity is afforded of applying remedial means directly to the ulcerated surface. From the tracheal wound, the nitrate of silver may be applied freely to the diseased surface, more readily and accurately than through the glottis. And thus, healing may be obtained at an earlier period than other-

wise could have been possible; the part recovers without loss of substance; and after a time, the tube may be finally withdrawn, leaving the cure complete. When, however, tracheotomy has been performed at an advanced period of the case, on account of emergency caused by œdema, the tube's discontinuance is very uncertain; a falling in of the box of the larynx is too probable, as the result of cicatrization; and in consequence, permanency of the artificial opening may be rendered indispensable.

2. *Tubercular Ulceration* not unfrequently attacks the windpipe; constituting the true *Phthisis Laryngea*. There is first submucous or mucous deposit of tubercle, which softens, disintegrates, and opens up the membrane in patchy chronic ulceration. The scrofulous cachexy attends; and too frequently, also, phthisis pulmonalis is coexistent. Although by no means likely to make a satisfactory impression on such a constitutional malady, still, the ordinary treatment is to be patiently employed. Tracheotomy is certainly not advisable, as a means towards cicatrization and cure; but it may be had recourse to as a mere palliative—a means of protracting existence—when, by the occurrence of œdema, life is threatened from suffocation.

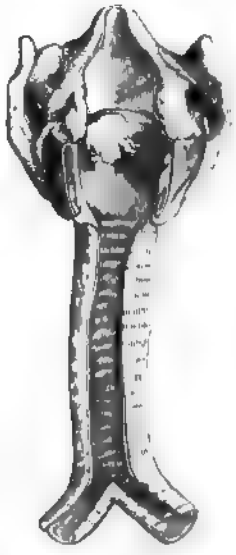
3. *A diseased state of the cartilage* is not unfrequent, in broken-down mercurio-syphilitic habits; associated with chronic abscess and ulceration. In advanced age, the cartilages become ossified, and may necrose. But this which we now allude to is a different affection; bearing the same analogy to senile degeneration of cartilage, as atheromatous deposit in the arterial tissue, favorable to aneurism, does to the senile calcareous condition of arteries. The cartilage is thickened, indurated, changed in hue, and partially ossified; portions die; suppuration takes place around; the matter bursts into the windpipe, and is expectorated; a ragged ulcerated aperture remains; the diseased portion of cartilage loosens, protrudes, and, having been wholly detached, is expectorated; the cavity which held it may then contract and close, along with the ulcerated aperture through which it made its escape; or additional suppuration takes place, fresh portions become necrosed, and the disease is both aggravated and protracted. In the most favorable point of view, prognosis is unsatisfactory; for cicatrization cannot take place, without entailing such contraction and change of the canal as must seriously and permanently interfere with respiration. Sometimes a dead portion of ossified cartilage, having been detached, falls downwards; and becoming impacted in a bronchial ramification, leads to a fatal issue, either suddenly by asphyxia, or more remotely through pulmonary disease.

Treatment is as in ordinary ulceration of this part, with especial attention to the constitutional vice. And when an emergency, perilling life, does occur, by intercurrent œdema of the larynx, tracheotomy is certainly advisable; not with the hope of thorough cure, but in order to avert immediate danger, and perhaps to accelerate cicatrization. If life continue, the tube must be permanently worn; for, under the most favorable circumstances, it is not to be expected, in this affection, that normal caliber and function can be regained.

Tracheal Fistula is apt to result from the preceding affection. The abscess connected with the necrosed portion of cartilage may discharge

itself externally, as well as into the windpipe, and a fistulous aperture is not unlikely to remain. This may be brought to heal, by the occasional use, at long intervals, of heated wire (*Principles*, 3d Am. Ed. p. 221). But let no attempt at closure be made, until we are certain that the necrosed portion has been fairly extruded, and that no fresh sequestrum is in progress there; otherwise, by confining the matter, and so causing swelling and obstruction, serious consequences to respiration may ensue.

Fig. 116.



Warts in the Larynx; growing in the situation of the vocal chords.

Warts of the Larynx.

Warty excrescences have sometimes been found growing from the lining membrane of the larynx, at its upper part; and solid enlargements of structure, pendulous, pyriform, and of the nature of polypus, have also, though still more rarely, occurred. They necessarily impede respiration; and, by leading to an inflammatory accession, with its attendant œdema, they may bring life into sudden and imminent jeopardy. The voice is hoarse, and ultimately lost; a hard cough, like that of croup, is troublesome; and during deglutition and expectoration, the sensation is felt of a foreign body in the larynx; but the most characteristic evidences are the expulsion of small portions of the tumor by coughing, and the seeing and feeling its upper part by careful and deep exploration of the fauces. When an emergency by dyspnœa occurs, tracheotomy is plainly required. Through the wound—made more free than usual—the growth is removed, by evulsion or knife. And for some days, at least, the use of the tracheotomy tube will be expedient, lest inflammatory swelling occur at the injured part.[1]

Stricture of the Windpipe.

Contraction of this tube is liable to occur, at various points, and from various causes; by contraction of the wound after cut throat; by contraction after cicatrization of ulcers; by change of structure following on chronic laryngitis, independent of ulceration; by necrosis and discharge of portions of cartilage, and consequent narrowing of the passage after closure of the ulcerated cavities. It is doubtful whether our art may be able to restore the normal caliber and function in such cases, by dilatation, as in similar affections of other mucous canals. The experiment has been made;[2] but the present voice of experience is as yet scarcely in favor of the measure—except in the case of contraction

[1] *Vide* Monthly Journal, Dec. 1846, p. 458.
[2] Liston, Elements, p. 463.

after wound (p. 258). Life may often be protracted, however, and suffering alleviated, by continued use of the tracheotomy-tube, of full

Fig. 117.

Double Stricture of the Trachea: the canal decidedly dilated on the lower aspect of the second contraction.

"The patient had worn a small silver tube in an opening in his windpipe for many years. It was originally introduced on account of long-continued disease of the larynx, with dreadful suffering and constant sense of impending suffocation. He could not be made to dispense with the tube entirely, as he felt, immediately on the wound closing, a threatening of return of his painful and dangerous symptoms. A small one was substituted for that at first used. He led a very irregular life, used a vast quantity of opium, and no small amount of spirituous liquors. He used to be out in the open air occasionally all night, and suffered repeatedly under attacks of bronchitis. He was under treatment again and again in the hospital, on account of rheumatic affection and deranged digestive organs. He used occasionally to present himself, complaining of difficult breathing, and stating that his silver tube was too short. He could articulate tolerably well when he stopped with his finger the orifice of the silver tube; at all times a part of the respired air passing through the natural channel. Latterly, he used to suffer from threatening of suffocation, and he used to relieve himself of the cause of this, viz., the inspissated and ropy mucus which got entangled in the trachea, then not suspected to be in a diseased state, by pushing through the opening in his neck and into the bronchi, long turkeys' feathers; of these he carried a good store, and some are now in my possession. This feat he performed without causing the slightest excitement or coughing. Ultimately, and about twelve years after the operation had been performed, he died, principally from diseased viscera." (Liston, Vide *Elements of Surgery*, p. 454.)

size; and by unremitting attention to keep both tube and trachea free from accumulation of viscid mucus. The latter indication may become of easy fulfilment, in consequence of the tracheal and bronchial membrane losing much of its sensibility—becoming almost cutaneous in this respect, and not resenting a tolerably free use of probe, feather, sponge, or other means employed for clearing the passage.

Formation of Matter near the Larynx.

Diffuse infiltration of purulent matter may take place, deeply, in the neck; and the consequent swelling and tension may seriously impede respiration, by encroaching on the canal of the windpipe. The proper remedy is free incision of the infiltrated part, whereby both cause and

effect are at once removed. Should this fail, or should the symptoms prove obscure, so as not to warrant or even indicate incision, tracheotomy is certainly advisable.

Circumscribed abscess may form in the vicinity of the larynx. And the rules of practice are the same; an early evacuating incision, if possible; otherwise, tracheotomy.

Bronchotomy, then, *is available* in the following cases: 1. In the case of *foreign bodies* lodged in, or otherwise obstructing, the air-passages. Extrusion, independently of this operation, may be expected to be the exception to the general rule. 2. *In suspended animation;* when we cannot otherwise effect, with certainty, artificial inflation of the lungs—as will rarely be the case. 3. In *spasm* of the glottis. Threatened asphyxia from external injury may perhaps depend on this cause—perhaps on a precisely opposite condition; in either case, the operation is demanded to save life. And there is a like necessity, in the spasmodic occlusion of the glottis which attends poisoning by carbonic acid. In laryngismus stridulus, we withhold the operation, if possible, and trust to general treatment; yet we are aware that urgent circumstances may arise to demand the tracheal wound, at least with the hope of palliation, and perhaps with the effect of affording time for the effectual working of other remedies. In certain cases of thoracic aneurism, too, when laryngeal distress is occasioned by irritation of the recurrent nerve and threatens immediate death, tracheotomy is advisable—in some few cases, it may be, with more than the hope of mere palliation (p. 263). 4. In *œdema glottidis*, chronic and acute, there is no safety but by operation, so soon as the symptoms have become at all urgent. And, in the acute cases, there is good hope of speedy discontinuance of the tube, closure of the artificial aperture, and complete restoration of normal respiration. 5. In *laryngitis fibrinosa*, the operation is as warrantable as in urgent œdema, when the disease is limited to the larynx. But in most cases of true croup, in which the whole windpipe with its ramifications is involved, operation may rather be regarded as an exception to the general rule of non-interference; in the early stage, it is inexpedient, while mechanical obstruction to respiration is not yet threatened; in the more advanced period, it is likely to prove ineffectual. 6. In *purulent laryngitis*, there may be the same necessity for operation, and the same prospect of a good result, as in acute œdema. 7. In *chronic laryngitis* with thickening, the supervention of œdema, through inflammatory accession, may render operation indispensable to the preservation of life. 8. In *simple ulceration*, the same event may occur as that just mentioned in connection with mere thickening of the membrane. Or, independently of such an accidental crisis, operation may be deemed expedient, to assist the action of other remedial means, and by effecting early cicatrization to save structure and function. 9. In *ulceration, with disease of cartilage*, operation is likely to be required to save life from immediate danger by threatened asphyxia; but with little or no prospect of discontinuance of the tube's use. 10. In *phthisis laryngea*,

it may be similarly demanded for a temporary object; scarcely with a hope of contributing to cure; but rather as a means of protraction and palliation. 11. In *pressure on the windpipe*, caused by the formation of tumor or abscess, or by impaction of food in the œsophagus or pharynx—operation may be necessary, if the obstruction to respiration cannot be otherwise relieved, namely, by removal of the cause; by evacuation of the matter, extirpation or diminution of the tumor, or extrusion of the impacted substance. 12. In *cut throat*, tracheotomy is not unfrequently demanded to save life from impending asphyxia; and it may be expedient, at an early period of the case, to avert all such hazard, and to favor as well as permit immediate and entire closure of the wound. 13. In *glossitis*, in *tonsillitis*, and in extreme cases of *pharyngitis*, it is required, when swelling is so great, rapid, and uncontrollable as otherwise to render fatal asphyxia all but inevitable. 14. In *carotid aneurism* of large size—when, by circumstances, we are precluded from speedy recourse to deligation of the artery—life may be suddenly brought into peril, by supervention of the diffuse form on the circumscribed (*Principles*, 3d Am. Ed. p. 521), and consequent compression of the windpipe. Bronchotomy then is essential; and the tube will require to be worn, until by deligation of the artery we have effected such diminution in the bulk of the tumor as altogether to free the respiratory canal. 15. *Thoracic aneurisms*, by compressing and narrowing the air-passages, may simulate the results of inflammatory disease in the larynx; and, in such circumstances, little good can be expected from bronchotomy. In those cases, however, in which the tumor is small, and causes dangerous paroxysms of dyspnœa by spasm of the larynx arising from irritation of the recurrent nerve, the operation, as already stated, is certainly expedient (p. 264).

In the great majority of cases, tracheotomy is preferable to laryngotomy, for obvious reasons.

The *passing of tubes* into the windpipe, by the nose or mouth, has been proposed as a means of superseding bronchotomy. But modern experience limits their use to cases of suspended animation, unconnected with laryngeal or tracheal disease; and even then, their superiority may come to be a matter of question and doubt.

Laryngotomy.

The performance of this operation having been determined on, the patient is seated on a chair, with the head thrown back and steadied. A longitudinal incision is made over the box of the larynx, in the mesial space; by dissection, the crico-thyroid membrane is exposed; and through this an opening is then made by the knife—as free as the cartilaginous boundaries of the space will allow. There will seldom be any trouble by hemorrhage.

Tracheotomy.

Excepting the case of artificial respiration on account of asphyxia unconnected with laryngeal disease, the case of a foreign body impacted in the rima, and the case of a loose foreign body of small size within the windpipe, tracheotomy is certainly preferable to laryngotomy.

[It would seem, as the result of careful investigations, that the choice of laryngotomy or tracheotomy may, in most cases for which either operation is performed, be decided by the comparative facility with which, in any particular instance, either may be accomplished.

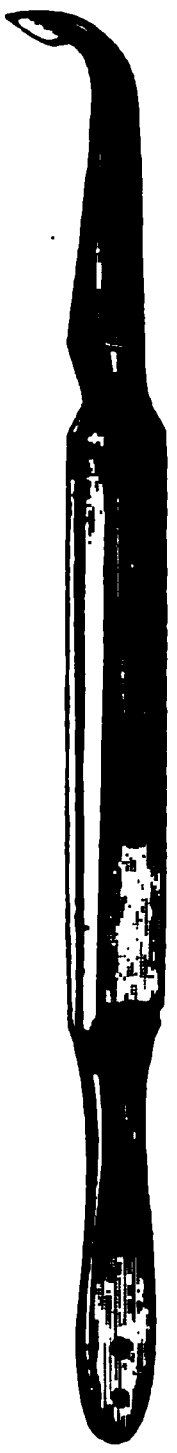
Mr. Prescott Hewett, in an interesting paper, published in the *London Journal of Medicine*, Feb. 1849, states, as the result of *post-mortem* examinations, that in all cases of acute inflammation of the larynx in adults, and in those cases that occur in children from swallowing boiling water or other irritating fluids, the obstruction is seated above the inferior vocal chords; the mucous membrane covering them, or that below them, not being in the slightest degree thickened; and that, consequently, as laryngotomy is a much simpler and safer operation than tracheotomy, it ought in such cases to be preferred.

This statement is confirmed by Mr. Erichsen, who says that he has examined many recent specimens of inflamed and obstructed larynx, and those preparations of laryngeal disease which are preserved in several of the London collections, without meeting with one in which an opening in the crico-thyroid membrane would not have relieved the asphyxia equally as well as one in the trachea. This examination determined him in future to have recourse to laryngotomy rather than to tracheotomy in acute obstructions of the glottis, whether primary, or supervening on chronic ulceration, or disease of the part. This determination was strengthened by the result of the *post-mortem* examination of two cases in which he had performed tracheotomy—the one, of old syphilitic disease of the larynx, followed by acute œdema; the other of erysipelas of the glottis, in both of which the obstruction was found to be situated above the inferior vocal chords.—*American Journal*, Oct. 1850, p. 515.—Ed.]

The patient having been placed as for tracheotomy, an incision is made in the mesial line of the lower part of the neck, from an inch and a half to two inches in length, the upper portion terminating a little above the cricoid cartilage. Skin, fat, and fascia having been divided, the commissure of the sterno-hyoid muscles is exposed; and this is carefully separated by the handle of the knife. The tracheal rings are made bare; detachment of the areolar investment being effected by either the point or handle of the knife, according to circumstances. Then the patient, if adult and conscious, is directed to swallow saliva. While the windpipe is rendered tense and elongated in the act of deglutition, the scalpel is made to penetrate at the lower part of the wound, with its back to the sternum; and, by a sawing movement of the instrument upwards, the necessary extent of tracheal wound is completed; the isthmus of the thyroid gland being pushed out of harm's way, by the finger—upwards. [In the last edition of his *Practical*

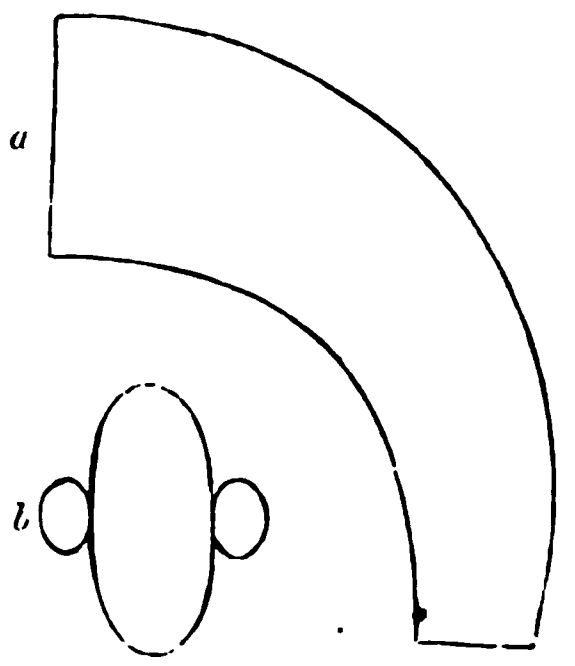
Surgery, Mr. Fergusson has described an instrument which was exposed at the Great Exhibition, in 1851. It is the contrivance of a M. Garin, of Lyons. It resembles a pair of common forceps in shape and appearance, excepting that the extremity of one blade is bent, as shown in the figure. The blades, when closed, are about the size of a small scalpel, and one is so sharp at the point and on the side, that it will readily pierce and cut the trachea—whereupon they may be allowed to separate, when they will hold the sides of the incision asunder, for the purposes of the operation.—Ed.] If the operation have been undertaken on account of the lodgement of a foreign body, no tube is necessary. The wound having been made, the foreign substance, if loose, will be expelled at once; if not, it is to be sought for by probe and forceps, as formerly stated. In the case of disease, it is our object to establish a constant and sufficient aperture for respiration, at the site of the wound; accordingly, a curved silver canula is introduced; and this is retained by tapes passing from a ring on each side of the canula, to be secured behind the neck. The canula is of sufficient size to atone, completely, for the temporarily occluded rima; varying, consequently, according to age; and, generally, of not much less diameter than the trachea which receives it. Yet it should not be so large as to press harshly on the lining membrane of the passage, lest ulceration be induced. The wound should be of size sufficient to receive the canula, without force, and yet not too freely; the cut margins should be compressed by the canula, internal escape of blood being so prevented; and this object is farther contributed to by the conical form of the instrument. To facilitate introduction, the canula may be provided with a plug, the bulbous end projecting—as in the vaginal speculum; an

[Fig. 118.]



[Instrument of M. Garin for opening the Trachea. (From Fergusson.) —Ed.]

Fig. 119.

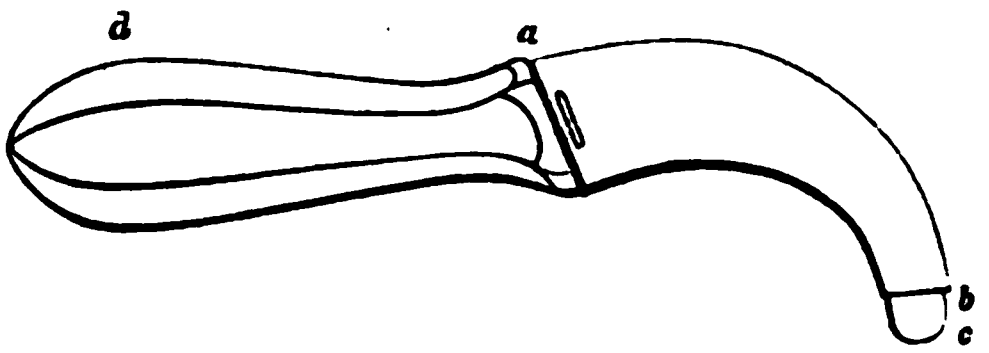


Ordinary Canula. *a*. In profile; *b*. Transverse section of orifice.

idea for which we are indebted to Dr. W. T. Gairdner. The patient is laid on his side, so as to render the wound dependent and favorable to the outward escape of blood and mucus. After a time, when the conical form of the tube is no longer an advantage, on account of hemor-

rhage, an instrument of uniform caliber may be substituted, as more suitable for respiration. And in cases of old standing—more especially

Fig. 120.



Canula, as recommended by Dr. Gairdner. From *a* to *b* the canula. *c*. The end of the plug, projected. *d*. The handle of the plug. The plug is of course withdrawn, so soon as the canula has entered the windpipe.

those in which the tube is permanently retained—a double canula may be used; one portion being removed from time to time, for the purpose of being cleaned, while the other remains, keeping the canal constantly free. To the orifice of such an instrument, too, it is well to attach a valve, which, opening to the full in inspiration, leaves the whole space free, but, shutting in expiration, forms a smaller aperture suitable for expectoration.

The circumstance of the canula's introduction being itself an efficient hemostatic means, materially facilitates performance of the operation.[1] It is not necessary to wait for entire cessation of bleeding before opening the windpipe; no valuable time need be lost in stemming oozing; main jets of blood, if any, having been secured, the tracheal wound is at once made, and the tube as speedily introduced. At first, the presence of the foreign body, and of the small quantity of blood which has necessarily entered along with it, is much resented; a violent fit of spasmodic cough, threatening suffocation, ensues; but the blood having been thrown back, through the tube, this fit of irritation passes off, and comparatively calm respiration is speedily established through the artificial opening. For many hours—but more especially during the first few—the patient must be carefully watched, lest the tube become obstructed by mucus; and this is from time to time to be cleared away, by a probe, armed with lint or sponge, or by a feather; or the double canula may be used from the first, admitting of one portion remaining in the wound, while the other is withdrawn and cleaned occasionally. Such attention is particularly necessary, as formerly stated, if the patient have fallen asleep after the operation (p. 266). When expectoration is attempted, it is necessary to diminish the aperture of the ordinary tube very considerably, by temporary application of the finger, so that the expired air may be expelled forcibly. At first, this narrowing is made by the surgeon; but soon the patient becomes an adept in the simple manipulation. Should he grow too weak to expectorate, it is well to attempt extraction of the mucus by suction; by the adaptation of a syringe, or by the mouth of an assistant, if possible.

[1] The tube is a hemostatic, not only by its pressure on the edges of the wound, but, also, and very importantly, by freeing the venous return in the neck, which, during dyspnœa, is necessarily much retarded.

As already seen, in some cases the tube may be withdrawn, and the wound permanently closed, after a few days or weeks; in other cases, normal respiration can never be restored, and the tube must be worn during the remainder of life. And, in these latter, it is truly surprising how little inconvenience is sustained; respiration becomes easy and silent, and even the voice may be regained, so far as to admit of the patient fulfilling the ordinary duties and customs of society.

The prominent danger of the operation is by hemorrhage. During the incisions, this is to be guarded against by caution in the placing and making of them; more especially avoiding the large veins which are often to be found in the lower and front part of the neck; and if any stray vessel be encountered, it should be held carefully out of the way by an assistant. Arterial branches, which spring, are to be secured by ligature; to venous orifices, temporary pressure may be applied. On account of mere venous bleeding, however, no delay should take place; more especially when the operation is being performed on account of dyspnœa; for the most likely means of freeing respiration, favoring venous return, and obtaining a comparatively quiescent and empty state of the veins implicated, is by lodging the tube in the tracheal wound.

It has been often proposed, with a view to render the operation both more simple and safe, to perforate the trachea by means of a trocar and canula, discarding the knife. The proposal looks well in theory, but has found no favor with the practical surgeon, for reasons too obvious to require their formal statement.

In all cases, it is obviously of much importance to keep the patient in an equable and genial temperature, to cover the wound with some cloth of loose texture, and to take every other means which may suggest itself, as likely to ward off the accession of inflammatory action by the stimulus of cold air directly applied to the membrane, as in the case of cut throat (p. 255).

In the child, operation may be rendered extremely difficult, by the restlessness of the patient, the crying and struggling which engorge the veins, the small size of the trachea, the limited space of the neck, the number of veins likely to be encountered, and the intolerance of loss of blood on the part of the system. The dissection must be conducted with unusual caution; and it is well, after exposure of the trachea, to fix it by means of a sharp hook, so as at once to facilitate and render more safe the performance of the tracheal wound. So soon as this has been effected, the child should be instantly turned upon its face, so as to prevent, as far as possible, escape of blood into the trachea. On cessation of the hemorrhage, the ordinary position may be resumed, should the circumstances of the case render this expedient.

In most cases, anæsthesia will be considered inexpedient, except during exploration by forceps after the operation has been performed, on account of the lodgement of a foreign body (p. 261).

[The danger of hemorrhage from the necessary division of the parts may, to a great extent, be obviated by attention to the mode in which this division is effected. Dr. Pancoast, of this city, who has performed this operation repeatedly, advises that the tissue which connects the sterno-thyroid muscles be *torn* by means of the handle of the scalpel,

instead of *cut* with its blade; and that the isthmus of the thyroid gland, if it descend low enough to interfere with the opening of the trachea, be first tied on each side of the median line, and then divided between the two ligatures.

It is well, also, to remove the *tracheal fascia*, of Mr. Porter, from around the proposed line of incision of the tube, before opening the latter, lest emphysema of the surrounding parts should subsequently occur.

The *tracheal tube* recommended in the text is itself a source of irritation to the tracheal mucous membrane, when introduced through the wound; and, as mentioned by the author, it will require frequent cleaning, which will add to the disturbance it produces. To obviate or avoid this disadvantage, an elliptical piece of the trachea may be excised, large enough to permit free ingress and egress of air, and the expulsion and removal of blood and mucus. This plan was recommended by Mr. Porter, and is generally practised by Dr. Pancoast, of this city.

A very simple means of preventing the integuments from falling over the tracheal wound has been suggested by Dr. Pancoast. It consists in passing a blunt-hook, or a piece of lead or pewter, properly bent, under each flap of the incision, and tying them around the neck sufficiently tight to insure the requisite separation of the margins of the wound. After a few days, this apparatus may be dispensed with, as the integuments will have retracted. A more elegant, and perhaps more efficient contrivance than the hooks is recommended by Dr. Smith (*Operative Surgery*, p. 254, and Plate xxx. Fig. 12). It is made of two pieces of broad watch-spring, each being properly bent at one end, to draw aside the flaps; the other ends are connected to each other, so as to slide one upon the other, and thus to increase or diminish the length of the band which is intended to pass around the neck, from behind, forwards; the necessary length of the spring can be secured by turning a screw which fixes the slide.

The after-treatment, particularly in croup, is a matter of great importance. The air inspired should be not only of the proper temperature, but of the *proper degree of moisture*, so as to resemble that inhaled in health; the patient should be carefully watched for several days and nights, so that no obstruction of the tracheal wound shall occur; a few drops of nitrate of silver, of the proper strength (℈i to ʒss in ℥j of water), may be introduced into the wound from time to time, or some medicated vapor may be inhaled, as shall be deemed expedient.

The reader may consult with advantage two papers, by Dr. J. F. Meigs, published in the American Journal, for April, 1847, and April, 1849, respectively; one by Dr. Pepper, in the Transactions of the College of Physicians, of Philadelphia, in the volume for 1851; also a pamphlet by Dr. Ware, of Boston, on the Diagnosis of the Different Forms of Croup, Boston, 1852.—Ed.]

Bronchocele, or Goitre.

The term denotes swelling of the thyroid gland, and this may be of various kinds. 1. *Mere hypertrophy* is common, the enlargement being essentially chronic and very gradual, and ultimately making a transition into the state of simple tumor (*Principles*, 3d Am. Ed. pp.

278 and 292). The whole gland may be equally involved, or the isthmus also may enlarge, while the lobes remain of a normal character; more frequently one or other lobe is the seat of the partial affection, and sometimes both lobes are involved while the central portion remains free. And, indeed, the same remarks, as to the partial or general character of the swelling, apply to the other varieties of the affection. 2. The swelling may be of a *cystic* nature, the stroma being analogous to the structure of simple tumor, the cysts either numerous and small, or few and capacious, delicate, and filled with a glairy fluid. This probably is the most frequent form of the disease. 3. The simple stroma may contain a greater or less amount of *calcareous* matter, giving much density to the tumor, which is seldom then of large size. 5. The tumor may be *malignant*. Carcinoma is rare. Cephaloma, which is not so, follows its ordinary course, and presents its usual characters.

[Fig. 121.]

[Fig. 121. Bronchocele, from a specimen in King's College Collection. The œsophagus pushed to the right by the tumor. (From Druitt.)

[Fig. 122.]

Fig 122. Drawing from a preparation in the Middlesex Hospital. The cystoid appearance of a section. (From Druitt.)—Ed.

Bronchocele is, in certain localities, an endemic disorder. In the Tyrol, and in the valley of the Rhone, it is especially so, and there almost invariably associated with a sadly deteriorated condition of the frame, to which the term Cretinism has been applied. In this country, the disease is comparatively rare, and happily such an unfortunate combination but seldom exists. In Derbyshire, and some other counties, both in Scotland and England, however, it merits the appellation of endemic. The majority of the patients are female, and the ordinary period of invasion is about the time of puberty. The most prominent symptom is inconvenience, with deformity, occasioned by the bulky swelling. Growth is gradual and painless, unless in the malignant variety. The indications by touch vary according to the nature of the interior. As the tumor enlarges, the head becomes disordered, in consequence of venous return thence being interfered with, and respiration also is more or less seriously impeded, by pressure on the windpipe,

especially when the central portion of the gland is affected. Partial enlargement, affecting but one lobe, is apt to simulate carotid aneurism, receiving a decided impulse from the adjacent vessel, and careful manipulation is necessary to arrive at a correct diagnosis. In addition to the ordinary diagnostics (*Principles*, 3d Am. Ed. p. 529), it is to be borne in mind that, on deglutition being performed, a bronchocele will be found to move upwards with the larynx, while an aneurism remains unaffected.

The causes of the disease are scarcely yet evolved from obscurity. Where endemic, it seems certainly connected with habitual use of unwholesome water as an article of food, and habitual exposure to a humid atmosphere; and this circumstance necessarily possesses an important bearing on the question of cure.

Treatment.—In reference to treatment, the examples of this disease may be conveniently divided into two classes—those which are merely deformities, unseemly and somewhat troublesome by their bulk, and those which bring life into peril, directly or indirectly, by interference with the brain and the air-passages. For the latter, the most determined remedial means may be with all propriety resorted to; for the former, heroics are not warrantable. And, fortunately, the majority of cases, in this country, demand only the milder form of treatment. Iodine has long been regarded as the most powerful remedy, and justly. Internally, it is administered in the form of iodide of potassium, or combined, as with iron. Externally, it is applied in the form of solution, painted frequently on the swelling; or ointment, or liniment, rubbed in; moderate leeching having been premised, in those cases in which continuance of nutritive excitement may seem to render such a measure expedient; our object being to arrest growth, as well as to discuss bulk already attained. At the same time, habitual exposure to a dry and otherwise salubrious atmosphere, with habitual use of sound water, chalybeate if possible, are curative indications by no means to be neglected. And such treatment will be carefully maintained, so as to prevent a tumor, originally of the first class, from becoming of the second, and seriously perilling life by interfering with both breathing and circulation.

Central tumors, pressing on the windpipe, may be removed by operation, when of no great size; partly by excision, partly by deligation. By the scalpel, the integuments are freely divided and turned aside; the tumor is laterally separated from its connections, care being taken to secure each arterial orifice by ligature, so soon as divided, and each venous orifice, as far as possible, by pressure of the fingers of an assistant; and having proceeded as far with the knife, in the work of detachment, as prudence will allow, the remainder of the connections are to be included tightly in ligature. A strong needle is passed beneath the base of the tumor, the double ligature is divided, and each portion is tied separately, so as to strangulate the mass (*Principles*, 3d Am. Ed. p. 562, Fig. 199). Tumors of the isthmus have been thus removed successfully; and it is probable that the same principle of operation may sometimes be extended to other swellings not limited to that part of the gland.

Large, solid bronchoceles, involving the whole gland, and of greatest bulk laterally, are not amenable to such radical cure. Their size, site, and attachments preclude the use of ligature; and attempted removal by the knife could scarcely fail to prove fatal by hemorrhage. Of late, however, an ingenious mode of operation has been devised by M. Porta, founded on observing that the large arteries which supply the thyroid gland, do not enter the interior of it, but break up into numerous small branches at the circumference, and that, consequently, hemorrhage need be dreaded only when the exterior part of the tumor is interfered with. Besides, the majority of simple bronchoceles he found to consist of numerous cellular or cystic developments, which push aside the proper texture of the gland, reducing that to the condition of a simple envelop, on dividing which the new products are exposed, or may be extracted without difficulty, injuring only small vessels, and leaving behind a fleshy sac which collapses, leaving no trace of the tumor. Accordingly, the operation is performed thus: the integuments of the neck, and usually, also, the omo-hyoid muscle, are divided by incision; the tumor is cut into, avoiding the trunks of the thyroid arteries; if any of these spring, they are tied or twisted; the exposed cysts are removed by forceps, or the handle of the knife; more solid structure, if it exist, is broken down and extruded by the same means; and, bleeding having been arrested, the wound is closed.[1]

In hopeless cases life may be protracted, and great relief afforded, by subcutaneous section of one or both sterno-mastoid muscles, so as to diminish tension, favor outward growth, and relieve the trachea and jugular from compression. In some cases, also, protraction and palliation may be obtained by tracheotomy, when the circumstances of the case are such as to render the performance of that operation practicable.

For the purely cystic bronchocele, simpler means may supersede the more formidable operation of M. Porta. Iodine may be injected as in hydrocele (and to such affections some apply the term hydrocele of the neck, p. 246), or a seton may be used. The cyst having been punctured, and its contents evacuated, a few threads of silk may be passed through the substance of the swelling and retained. It is probable that the inflammatory result will lead to obliteration of the cystic formation; but much care is necessary in watching the action, lest it prove excessive, and threaten asphyxia through sudden and great enlargement of the swelling. For the solid tumors, the seton is not well adapted; it not only fails to discuss, but is also exceedingly prone to accelerate growth.

The malignant bronchoceles, fortunately rare, are incurable.

[The reader will find a valuable paper on Goitre, in Henle and Pfeufer's *Zeitschrift für Rationelle Medizin*, vol. vi. p. 123; in which the author, Professor Ecker, of Basle, deduces all the various forms of the affection from *two primitive* ones. These he designates *struma vasculosa*, and *struma glandulosa*, corresponding with the two important anatomical elements of the thyroid gland, the vascular and the secreting. His

[1] Brit. and For. Med.-Chir. Rev. Jan. 1851, p. 106.

paper is based upon careful investigations of the normal and morbid anatomy of the organ, and will be found very interesting and instructive. It may be well, also, to refer to the chapter on diseases of the thyroid gland, in Hasse's *Pathological Anatomy*, and in Rokitansky's fourth volume, the Sydenham Society's edition.—ED.]

Tumors over the Thyroid Gland.

Not unfrequently cystic formations are found, not in the substance of the thyroid gland, but between this and the integument. If of small size and circumscribed, they may be dissected out. Those which are large may be treated by seton or injection.

Enlargement of the Thyro-hyoid Bursa.

Like other bursæ, that which is situated between the hyoid bone and thyroid cartilage is liable to enlargement, chronic or acute; causing more or less swelling, with pain and obstruction to the movements of the neck. The acute form is met by repeated leeching and fomentation; the chronic is appropriately treated by the local application of Iodine in solution, or by other discutients.

Hernia Bronchalis.

A rare affection, so called, has been observed in those who habitually strain the throat in loud and sustained calling. A fold of the lining membrane is protruded outwards between two tracheal cartilages; and thus a greater or less tumor, soft and compressible, is formed, according to the extent of protrusion. The only remedial means advisable are such outward applications as are likely, by affording external support, to oppose farther enlargement. And the exciting cause—straining of the throat—is, of course, to be discontinued.

Disease of the Cervical Vertebræ.

The chain of cervical vertebræ, like other bones with their articulating surfaces, is liable to disease of various kinds: 1. The bodies of the vertebræ may be interstitially absorbed. Then a greater or less degree of curvature is likely to ensue; the head usually bending forwards, with deviation to one or other side; and, not unfrequently, there is thickening of the soft parts exteriorly, in consequence of a chronic inflammatory process slowly advancing there. 2. Or the bodies of the vertebræ are affected by the results of true inflammation. At first, there are thickening, hardness, and tenderness on pressure; indicating the ostitic and periostitic stage. Afterwards matter forms, the bones are eroded by ulceration, and portions may be detached in the form of sequestra. There are pain, swelling, tenderness on pressure, and the other usual signs of an advancing action of disorganization. More or less deformity, by curvature, necessarily ensues; partly from change in the bones, partly from a wasted and paralyzed state of the extensor muscles. As

can be readily understood, deglutition is early and much interfered with; and by encroachment on, and involvement of, the cervical nerves, serious results are likely to occur, as regards respiration. The functions of the superior extremities, too, may be perilled, by affection of the brachial plexus. The disease is generally connected, in the patient's narrative, with external injury; and the persons most likely to be affected are the young and strumous. 3. Or the disease may originate in the articulating textures; ultimately inducing similarly destructive results. 4. There is good reason to believe that, not unfrequently, such affections follow in regular succession; the diseased action commencing in interstitial absorption of the bones, advancing from absorption to true inflammation, and ultimately disorganizing both bone and joint.

The obvious treatment of such disease is, to endeavor to arrest its course by leeching and counter-irritation—the latter of the graver sort (moxa, or actual cautery), and patiently continued; to exhibit iodide of potassium internally, more especially when taint of the system is suspected; to keep the part at rest; and, in the advanced cases, to relieve the affected bones from the weight of the head, as much as possible, by mechanical means. A firm iron rod, fixed in a circular girth on the trunk, passes upwards, excurvating to receive the posterior part of the head, and terminating over the forehead; and by a bandage or strap attached to the extremity of the rod, and passed under the chin, the required support is afforded. All suddenness of motion in the neck is especially to be avoided; but, indeed, in most cases, the patient has an instinctive dread of such risk, and carefully guards against it; turning the head slowly, and with the chin supported on the hand. In the case of disease affecting the atlas and dentata, such precaution is particularly necessary; lest, by sudden rupture of the ligamentous apparatus, displacement should occur, causing fatal compression of the medulla. Should matter form in considerable quantity, and seek to approach the surface, at the lateral or posterior part of the neck, a free and early incision is to be made for evacuation. In advanced cases, the only hope of cure is by anchylosis.

Cheyne, The Pathology of the Larynx and Bronchia, Edin. 1810. Burns, Surgical Anatomy of the Head and Neck, Edin. 1824. Lawrence, Med.-Chir. Trans. vol. vi. p. 221. Bretonneau, des Inflammations Spéciales du Tissu Muqueux, et en particulier de la Diphthérite, Paris, 1826. Cheyne, Cycl. of Pract. Med. (art. *Laryngitis*), vol. iii. London, 1833. Dupuytren, Clinique Chir. tom. iii. Paris, 1833. Tweedie, Cycl. of Pract. Med. (art. *Throat, diseases of*) vol. iv. London, 1834. Porter, The Surgical Pathology of the Larynx and Trachea, Dublin, 1837. Trousseau et Belloc, Traité de la Phthisie Laryngée, Paris, 1837. Trousseau de la Trachéotomie, L'Expérience, Nov. 5, 1840. Ley, on Laryngismus Stridulus; Henderson, on Laryngismus Stridulus, Monthly Journal, Jan. 1841, p. 10. Brodie, Case of Mr. Brunel, Med. Gazette, July 7, 1843. Watson, Lectures on the Practice of Physic, London, 1848. Green, Treatise on Diseases of the Air-Passages, New York, 1849. Copland, art. *Bronchocele*, Dict. of Pract. Medicine. Porta, Delle Malattie e delle Operazioni della Ghiandola Tiroidea, Milano, 1849. Todd, Cycl. of Anat. and Physiology, art. *Thyroid gland*, London, 1850. [For the treatment of œdema of the glottis by scarification, see papers by Dr. Gurdon Buck, in vols. i. and iv. of the Transactions of Am. Med. Association.]

CHAPTER XIX.

AFFECTIONS OF THE ARTERIES OF THE NECK AND SUPERIOR EXTREMITY.

Deligation of the Carotid.

THE *common carotid artery* may require deligation on account of aneurism, hemorrhage by ulcer or wound, or erectile tumor in the orbit. Carotid aneurism is usually situated at the upper part of the vessel, near the angle of the jaw; forming a tumor there of the ordinary characters, which, should it become diffuse, might seriously interfere with respiration. It possesses a peculiarity of being ill surrounded by repressing tissues; it grows chiefly towards the pharynx, and may imperfectly consolidate after operation (*Principles*, 3d Am. Ed. p. 541). Sometimes—but fortunately comparatively seldom—the disease affects the origin of the artery; and then its interference with respiration is more early and serious. From sudden increase of the tumor—by diffusion or otherwise—immediate performance of tracheotomy may be demanded to save from urgent threatening of asphyxia.

The artery may be secured at one of two points; above or below where it is crossed by the omo-hyoid muscle. The former situation is the more easy of access, and is to be preferred when circumstances are favorable; but in cases of aneurism, the tumor will generally be found to have encroached too far on the upper triangular space.

The superior operation is performed thus: The patient having been placed recumbent, with the head thrown back and turned slightly to the opposite side, an incision is made through the integuments, platysma myoides, and superficial fascia, extending in the direction of the inner border of the sterno-mastoid muscle, from near the angle of the jaw to the level of the cricoid cartilage. The deep fascia is carefully divided, with the use of forceps; cross veins are looked for, and avoided; the margins of the wound are held asunder by means of bent copper spatulæ; and it may be useful to relax the parts somewhat, by changing the position of the head. The descendens noni is pushed aside; the common sheath of the vessels having been pinched up by forceps, is opened to the requisite extent; and cautious isolation of the artery is proceeded with, so as to afford clear space for passage of the aneurism needle—and no more. The needle is passed from the outside; the jugular vein being repressed, if necessary; and thus risk is avoided of injuring the

vein, or including the par vagum.[1] Before securing the knot, especial care should be taken to ascertain that nothing but the arterial coats is included.

The inferior operation is more generally suitable in the case of aneurism, as already explained. The patient having been placed as before, an incision of about three inches in length, parallel to the inner border of the sterno-mastoid, is begun a little above the level of the cricoid cartilage. The inner border of the muscle, having been exposed, is cautiously turned outwards; while the sterno-hyoid and sterno-thyroid muscles are displaced in the opposite direction. The deep fascia is divided below the crossing of the omo-hyoid muscle; and, the sheath having been opened, the operation is completed as before. The descendens noni, in the former case in front of the sheath, is here found inclining to the tracheal side of the artery. On the left side, the jugular vein is very apt to prove troublesome by overlapping; on the right side, it recedes from the carotid, to meet the subclavian vein.

After the operation, congestion of the lungs, with its baneful consequences, must be guarded against by use of the lancet. And, in the case of aneurism at the angle of the jaw, external pressure is to be made on the tumor, so as to atone for the deficiency of repressive textures, formerly alluded to. It is well, also, to keep the neck bent so as to relax the artery.

The artery at its inferior part has been secured by a transverse wound; cutting the sterno-mastoid across, upon a director, and then opening the sheath in the ordinary way.[2]

In the case of aneurism at the root of the common carotid, deligation of the artery at its upper part may be practised, with a reasonable hope of cure. For, as formerly stated (*Principles*, 3d Am. Ed. p. 542), the common carotid is favorably adapted for Brasdor's operation.

Deligation of the external carotid, and its branches, is required only in the case of hemorrhage; and chiefly on account of wound. No definite rules need be given as to the operative procedure; this must be guided by the general principles formerly inculcated (*Principles*, 3d Am. Ed. pp. 349 and 533), and modified by the particular circumstances of the case.

Deligation of the Arteria Anonyma is an operation now considered hopeless; and in all probability, will never be repeated by any judicious surgeon; circumstances seeming to be insuperably hostile to satisfactory occlusion of the artery at the deligated point.

Deligation of the Subclavian.

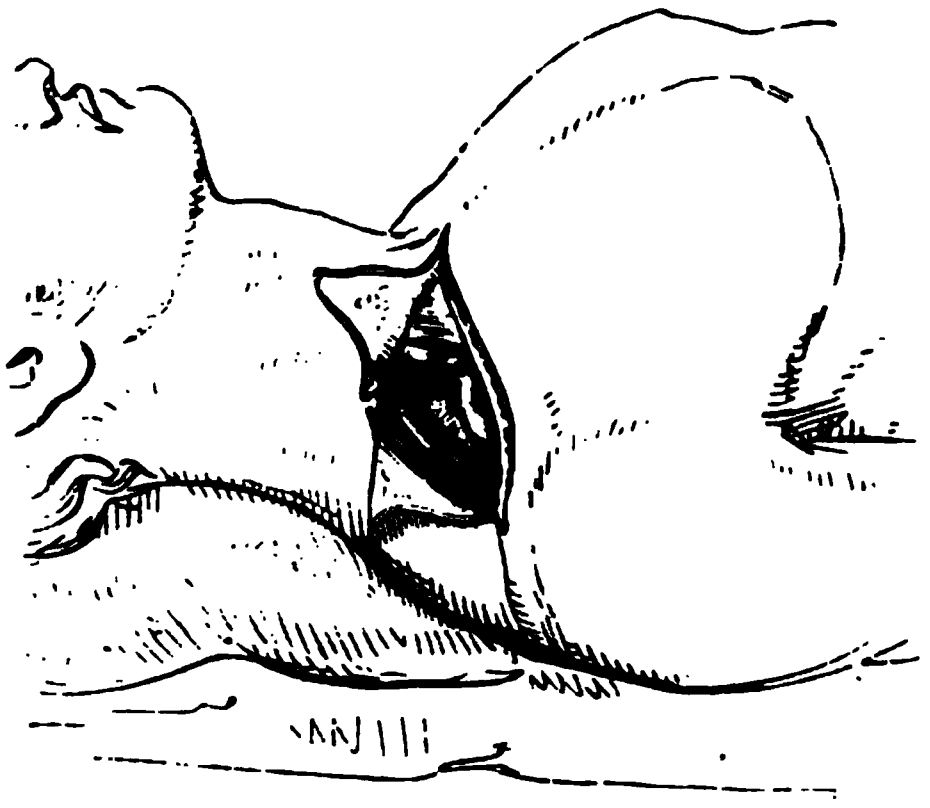
This artery requires ligature, on account of axillary aneurism. Hemorrhage by wound or ulcer is likely to call for the operation but rarely.

[1] From inattention to this rule, at an early period of my professional life, I had the misfortune to include the par vagum in the noose of the ligature. But it is some consolation to know that the accident was, in all probability, unconnected with the fatal issue of the case. I willingly record the circumstance here; that it may be of use, as a beacon, to deter and warn others from similar inattention and mishap.

[2] Hargrave, Dublin Quarterly Journal, Aug. 1849.

Surgically, the vessel is conveniently divided into three portions; internal, from its origin to the inner border of the scaleni; middle, where overlaid by the anterior scalenus; external, between the outer border of this muscle and the passage over the first rib. On the right side, it is possible to secure the artery at any of these parts of its

Fig. 123.



Plan of the relative position of the Subclavian Artery, in its outer third.

course; on the left, the last two only are practicable, the internal third being not only very deeply seated, but in close contact with most important parts, which can scarcely fail to sustain serious injury in the attempt. On either side, the middle third is not desirable; there being risk of serious injury to the phrenic nerve, as well as a probability of unsatisfactory occlusion on account of the near propinquity of large collateral branches at the deligated point. The external third is preferred. But if, in performing the ordinary operation on this part of the vessel, the coats appear unsound, we are fully warranted in cautiously turning aside the scalenus muscle, and seeking upwards for a more healthy portion.

Deligation of the external third is accomplished thus: The patient having been placed recumbent, on rather a high table, and the elevated shoulder having been forcibly depressed as much as possible, an incision is made over the clavicle, through the skin and platysma myoides; extending from the anterior border of the trapezius, to a little beyond the posterior border of the sterno-mastoid. And it is well to pull the skin downwards before using the knife, so that, on resilience, the wound may be more directly correspondent with the course of the vessel. A minor incision is made to fall into the first, passing along the posterior border of the sterno-mastoid; and the flap thus indicated is slightly reflected. The cervical fascia is divided; the external jugular vein is looked for, and turned aside; the posterior belly of the omo-hyoid may be disclosed; and then we know that in the triangular space between that and the clavicle, is contained the object of our search. The outer edge of the

scalenus muscle is sought for; at the same time a part of the brachial plexus is brought into view; and now the field of search is farther limited; the artery will be found by tracing the border of the muscle downwards, on a lower and more anterior plane than the portion of the plexus exposed. Placing our finger on the tubercle of the first rib, the artery is felt pulsating between; and the knife is guided accordingly. The vessel having been reached, is cautiously isolated to the requisite extent; and the needle is passed from the clavicular aspect, so as to avoid injury of the vein. Before securing the noose, pressure should be made by the finger on the included texture, so as to make sure that it is the artery. In making the downward dissection, caution is necessary near the clavicle; lest, first, the supra-scapular artery be wounded; and, afterwards, lest the vein should sustain injury. The artery, if cut, proves troublesome by hemorrhage; and, besides, the vessel is important as a means of collateral circulation after obstruction of the main trunk. In the great depth which has sometimes to be encountered in this situation, assistance may be derived from one or other of the auxiliary needles which have been invented; but it has so happened, hitherto, that the ordinary instrument, in skilful hands, has been found quite sufficient. In all cases, however, difficulty is to be contemplated; and in the dissection allowance must always be made for the increased depth of the vessel's site, resulting from displacement of the shoulder upwards by the axillary tumor.

To secure the middle third, a plan of incision very similar to that just described will suffice. The fibres of the scalenus are cut across with the greatest possible caution, so as to avoid injury of the phrenic nerve, which may be expected towards the inner margin; and the noose is applied with equal caution, to avoid, as far as possible, the arterial branches of this part of the vessel.

To expose the internal third, on the right side, let an incision be made a little above the clavicle, more anteriorly than in the former operations; and into this a second incision is made to fall, along the inner border of the sterno-mastoid. The sternal attachment of this muscle is then divided and turned aside, outwards. The sterno-hyoid and sterno-thyroid muscles, having been exposed, are divided cautiously from their outer border, and displaced forwards. The lower part of the carotid may then come into view; this is traced downwards, until the subclavian is reached; and this vessel is to be secured, neatly and accurately, as near as possible to the origin of the vertebral, so as to afford space enough between the ligature and the origin of the carotid. The textures to be avoided are the par vagum, and its recurrent branch, the cardiac branches of the sympathetic, the pleura, and the vein. The needle is passed from below upwards, to avoid wounding the pleura and right vena innominata. The operation is one of great difficulty, and not auspicious of a prosperous issue.

The varieties of distribution to which the arteries of the neck are liable, bear an important relation to the operations just described, and should ever be remembered and calculated upon by the surgeon.[1]

[1] *Vide* Quain on the "Arteries," with special reference to this subject. For the statistics of ligature of the subclavian, see Norris, American Journal of Med. Science, July, 1845.

Deligation of the Axillary.

Modern surgeons seem to have almost agreed, that this vessel should not be made the subject of operation, unless in the case of wound of itself; when the general principles of surgery are to be fulfilled, by cutting down upon the bleeding point, and placing a ligature above and below the aperture. In the case of aneurism high in the arm, encroaching so far upwards as to render deligation of the humeral either unadvisable or impracticable, the axillary, no doubt, may be secured; but it is an easier, more feasible, and altogether preferable operation, to tie the subclavian in its external third.

Like the subclavian, the axillary artery is surgically divided into three portions; an upper, middle, and lower. And supposing that we have determined on deligation of the axillary, in preference to the subclavian—as, probably, will very seldom be the case—either the lower or the upper third will be selected, seeing that the middle is so covered and mixed up with other textures, as to be almost inaccessible—with safety. The operation, accordingly, is said to be either superior or inferior.

The superior operation is performed thus: The patient having been placed recumbent, with an assistant ready to compress the subclavian in case of accident, an incision is made, about three inches in length, and of a semilunar form—with its convexity downwards; commencing about an inch from the sternal extremity of the clavicle, and extending towards the acromion. Or a similar extent of wound may be made, with its convexity upwards, terminating at the anterior margin of the deltoid. In the one case, the clavicular portion of the pectoralis major is at once cut across in the deep dissection; in the other, the intermuscular space is dilated. Care must be taken to avoid the cephalic vein and thoracico-acromialis artery. To expose the latter vessel, however, is scarcely an untoward occurrence, as it may happen to prove a convenient guide to the vessel of which we are in search. The deep fascia and fat are carefully cut through; and it may be necessary to turn down the upper border of the pectoralis minor. The vein, probably, will then be first disclosed; this is pressed inwards towards the ribs; and, the artery having been carefully isolated to the requisite extent, the needle is passed from the thoracic to the acromial aspect.

For the inferior operation, the arm is raised from the side, with the hand supinated. In the lower part of the axilla, thus exposed, the head of the humerus is felt; and over this an incision is made of about two inches in length, rather more to the posterior than to the anterior border of the axilla. Then, on dissecting through fascia and areolar tissue, the axillary vein and median nerve are likely to be exposed; the latter having been displaced outwards, and the former inwards, the artery will be brought into view. The needle is passed from the ulnar aspect. In the latter part of the operation, it is useful to relax the textures, by bending the forearm.

Deligation of the Humeral.

The brachial or humeral artery may be secured at any part of its course; on account of aneurism, true or false; on account of wound of the vessel itself; or on account of an otherwise uncontrollable hemorrhage from either the hand or the forearm. The arm having been steadied on a convenient table with the hand supinated, the operation is conducted thus:—

In the upper part of the arm, an incision of about two inches in length is placed over the vessel—felt pulsating—along the inner border of the coraco-brachialis muscle; and care is taken to avoid the basilic vein and internal cutaneous nerve, which may lie in the way. The fascia having been divided, the ulnar and internal cutaneous nerves, on the inside—the external cutaneous and median nerves, on the outside—the brachial veins close on each side—are avoided; the arm being bent, for the purpose of relaxing these tissues, if necessary. And the vessel having been isolated, the needle is passed from the ulnar aspect. Sometimes the median nerve is superficial to the artery.

At the middle of the arm, the incision is made along the inner border of the biceps muscle, which, overlapping the vessel, may require to be raised slightly. The median nerve is to be expected, superficial to the bloodvessels; and while this nerve is displaced inwards, and the muscle held outwards, the artery may be separated from its veins and secured. It is right to remember, however, that, in this situation, the inferior profunda may be mistaken for the main trunk, and also that, if there be a high division of the humeral, one of the two vessels only may have been tied. Not until the surgeon has been fully satisfied on both of these points, should the operation be completed by approximation of the wound. In the case of high division, the second trunk, if not close to the other, will be found either along the inner intermuscular septum, in a line with the inner condyle of the humerus; or near its usual situation, but deeply placed, and covered by fibres of the brachialis anticus muscle.

In the lower part of the arm, the median nerve is to be expected on the ulnar side of the artery; but it is seldom that we are called upon to operate in this situation; not, indeed, unless for wound of that part of the vessel.

At the bend of the arm, false aneurism of the humeral is proverbially common. Its nature and progress have been already described (*Principles*, 3d Am. Ed. p. 523). If prevention by methodical pressure have failed, the sac is to be cut into, and the vessel secured by ligature above and below the aperture, in recent cases. In tumors of old standing, deligation of the humeral, near its middle, is a simpler and equally effectual operation (*Principles*, 3d Am. Ed. p. 557). Varicose aneurism, occurring at this site, requires the same treatment as the ordinary form of tumor. For aneurismal varix, support by careful bandaging is usually sufficient (*Principles*, 3d Am. Ed. p. 559).

Deligation of the Arteries of the Forearm.

Deligation here is seldom if ever required, except in the case of hemorrhage from injury of the arteries themselves; and then it is sufficient to dilate the existing wound, and to secure the bleeding point, or

Fig. 124.

Deligation of the Humeral, Radial, and Ulnar Arteries; also of the Palmar Vessels.

points, in the usual way. For secondary bleeding in the palm, ligature of both ulnar and radial would not suffice; the interosseous must also be secured. And, instead of this threefold and difficult operation, it is infinitely better at once to perform that which, while much simpler, is equally effectual—deligation of the humeral a little below its middle.

The radial and ulnar arteries are most easily reached at the lower part of the forearm. For the radial, an incision is made on the radial side of the flexor carpi radialis. For the ulnar—made more superficial by bending back the hand and fingers[1]—the wound is placed on the radial side of the flexor carpi ulnaris. Near the elbow joint, the vessels

[1] Malgaigne, Brit. and For. Med.-Chir. Rev. July 1848, p. 265.

can be exposed only through a great thickness of muscular tissue. The prolongation of the radial, between the metacarpal bones of the thumb and forefinger, may be exposed by an incision on the ulnar aspect of the extensor secundi internodii pollicis.

Wounds of the Palmar Arch are apt to be troublesome by bleeding, both primarily and secondarily. In recent wounds, all bleeding points should be secured by ligature; dilatation being practised, if necessary, and moderate pressure afterwards applied. For bleeding occurring after the lapse of some days, exposure of the wound, with application of energetic pressure (*Principles*, 3d Am. Ed. p. 341), should be had recourse to; and if this fail, then deligation of the humeral should be practised.

Ramsden, Practical Observations, &c. London, 1811. Liston, Ed. Med. and Surg. Journal, vol. xvi. p. 348. A. Burns on the Surgical Anatomy of the Head and Neck, Edin. 1824. Dietrich, Das Aufsuchen, &c. Nurnberg, 1831. Manec on Ligature of Arteries, Paris, 1832. Harrison, Surgical Anatomy of the Arteries, Dublin, 1833. A. Cooper, Guy's Hospital Reports, vol. i. p. 53, 1836. R. Quain, Anatomy of the Arteries, with large plates, Lond. 1840.

CHAPTER XX.

AFFECTIONS OF THE BEND OF THE ARM.

Venesection.

THIS little operation—at one time, it is to be feared, too frequently performed—is conducted thus: The patient having been placed erect semierect, or recumbent, according as it is wished to withdraw much blood or otherwise (*Principles*, 3d Am. Ed. p. 159), a ligature—a ribbon, or bandage, or small tourniquet—is placed on the upper part of the arm, and secured with sufficient tightness to arrest the venous return, yet not so tightly as to interfere with the arterial influx—as indicated by the pulse at the wrist. The veins at the bend of the arm, thus made tense and bulging, are scrutinized with a view to selection. A branch which is superficial, and large enough to emit freely, is to be preferred, for obvious reasons; and, if possible, the median cephalic is chosen; for then we are less likely to interfere with the brachial artery, the fascia of the forearm, or the cutaneous nerves; and thus are avoided the risks of aneurism, diffuse inflammatory infiltration, and neuralgic pain. But if no vessel except that over the brachial is found suitable—as not unfrequently happens—then the operation must be conducted there with especial caution; care being taken merely to open, not to transfix the vein. The arm is placed nearly in a middle posture between pronation and supination; and precautions are taken to secure its being retained in that position unmoved. By the fingers or thumb of one hand—and it is well that the surgeon be ambidextrous in this proceeding—the vein is steadied; and, pressure being made at the same time on the distal aspect, spirting from the puncture is prevented. The lancet—neither too spear-pointed nor too rounded in its blade—held between the finger and thumb of the other hand, is introduced obliquely across the track of the vessel; and by gentle movement of it a sufficient aperture is made—the instrument being made to cut more with the shoulder than with the point, so as to insure the superficial part of the wound being considerably more free than the venous orifice. Then the

Fig. 125.

Illustration of Venesection at the bend of the arm.

blood is allowed to flow. If the stream grow sluggish, movement of the fingers will tend to its increase by forcing the contents of the intermuscular veins to the surface, and accelerating the general venous return; but care must be taken to avoid any deviation from the original position of the limb, otherwise an overlapping of the wound by integument will necessarily follow. The desired effect having been obtained, the ligature on the arm is slackened and removed; a thumb is placed on the wound; the arm is sponged and made clean; a neatly fitting graduated compress is applied; by a bandage passed in the form of the figure 8, all is secured; and the limb is placed comfortably in a bent posture, supported if need be by a sling. Within forty-eight hours, the bandage may be safely withdrawn; but it is well to avoid use of the arm for some days.

Accidents of Venesection.

1. *Thrombus.*—By this term is understood an accumulation of coagulated blood in the areolar tissue between the vein and integument; caused probably by overlapping of the latter; interfering with, and perhaps arresting, the flow of blood at the time of the operation; producing an inconvenient swelling afterwards, and not unfrequently inducing troublesome suppuration in and around the wound. The accident is to be avoided, by a suitably free opening being made at once, and by maintenance of one position of the arm throughout the whole proceeding. When thrombus has formed, the coagulum should be carefully removed, an enlargement of the wound being had recourse to, if necessary, and then a suitable compress is accurately applied, so as to keep the tissues in close contact. 2. *Neuralgic pains* may invade the limb; dependent, probably, on puncture of a cutaneous nerve. To avoid such accident, place the wound where this texture is least likely to be implicated; to cure it, dilate the wound by incision, and apply an anodyne epithem. 3. Simple *erysipelas* may follow, and the ordinary treatment is required (*Principles*, 3d Am. Ed. p. 367). 4. *Angeioleucitis* may occur *per se*, or in conjunction with the preceding affection. There is no peculiarity in the treatment (*Principles*, 3d Am. Ed. p. 581). 5. Not unfrequently, *diffuse inflammatory action* occurs beneath the fascia, which has probably been injured by puncture. Free incision is imperatively necessary; otherwise serious results, both local and constitutional, are almost certain to ensue. 6. Sometimes this last accident is associated with a superficial and simple erysipelas, or erythema. 7. *Aneurismal formations* have been already considered. And in reference to these it is well to remember, that the arteries of the forearm, following an unusual course, may be found quite superficial, and not unlike the ordinary veins. Hence a careful examination of the part should uniformly precede the performance of phlebotomy.[1]

[1] Lately, a new variety of the aneurismal lesion has been observed; the artery projecting its contents *through* the wounded vein, and forming an aneurismal sac by condensation of the areolar tissue exterior to the vein. The deep wound of the vein is closely incorporated with that of the artery; and the superficial venous aperture is continuous with the arterial sac.—*Brit. and For. Med.-Chir. Rev.* April, 1850, p. 338.

Sometimes, too, the aneurismal communication is not with the superficial, but with a *deep* vein.—*Ibid.* p. 349.

Affections of the Bursa over the Olecranon.

From habitual pressure, as in the miner, this bursa is liable to chronic enlargement, and the affection is to be treated in the ordinary way, by abstraction of pressure, and the application of discutients (*Principles*, 3d Am. Ed. p. 511).

Acute bursitis is a frequent consequence of blows on the elbow, and is usually associated with an erysipelatous affection of the surface. Treatment is by puncture and general antiphlogistics, and if matter form within the bursa, it should be early evacuated by free incision.

Lisfranc, Nouvelles Considérations sur la Saignée du Bras, Paris, 1813. Abernethy on Ill Effects of Bloodletting, Surgical Works, vol. ii. p. 188, Lond. 1815. Wardrop on Bloodletting, &c. Lond. 1825. Marshall Hall on the Effects of Bloodletting, Lond. 1836.

CHAPTER XXI.

AFFECTIONS OF THE WRIST AND HAND.

Ganglia and Thecal Collections.

GANGLIA frequently form on the wrist and back of the hand. When troublesome as well as unseemly, they may be got rid of, either by pressure, or by puncture of .the cyst (*Principles*, 3d Am. Ed. p. 513).

Collections of glairy fluid often occur in the thecæ of the flexor tendons in the lower part of the forearm, with or without loose bodies contained, forming a soft bulging swelling, which usually extends also to the palm, and more or less seriously interfering with the functions as well as with the symmetry of the limb. In the worst cases, it has latterly been the practice to make a free evacuating incision, dividing the annular ligament at the wrist completely through, in the belief that thus tension during subsequent inflammatory accession will be avoided. But experience has yet to show that the deformity and loss of power which result from condensation and deposit among the tendons by such cure, are less than those which attended the previously existing state of parts (*Principles*, 3d Am. Ed. p. 512).

According to M. Velpeau, it is most safe and effectual to evacuate the contents by a trocar's puncture, and then to inject iodine, as in the cure of hydrocele.

Paronychia.

No affection is more common than paronychia, or *Whitlow*, more especially among washerwomen, cooks, nurses, and others, whose fingers, by the nature of their avocations, are not only kept prone to the assumption of inflammatory action, but also much exposed to the application of its exciting causes. The disease varies both in site and intensity.

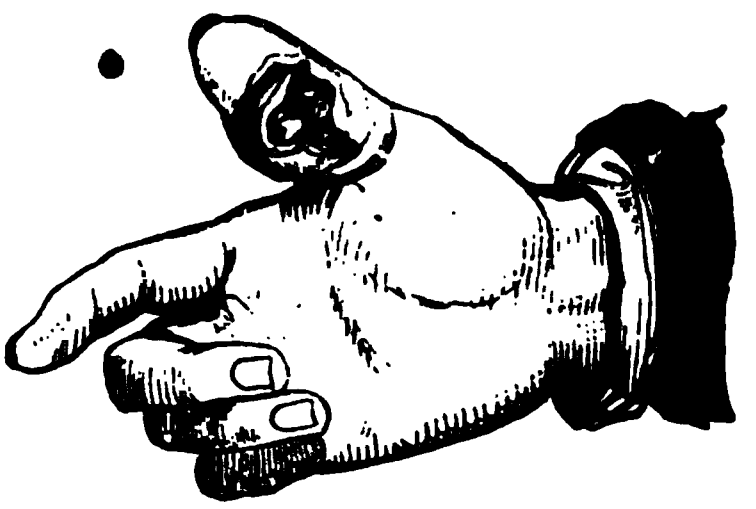
1. There is a mild form, limited to the very surface. The finger, at its point, and perhaps in its whole extent, is intensely hot and painful, red, and somewhat swollen, and vesications may be in process of forming. Treatment consists in leeching, fomentation, and general antiphlogistics. Or, as is more frequently practised, the part is rubbed lightly over with nitrate of silver, so as to blacken and desiccate the surface (*Principles*, 3d Am. Ed. p. 178). Resolution is usually effected, but often not without the formation of one or more vesicles, which sometimes degenerate into superficial ulcers of an irritable character.

The disease usually commences at the root of the nail, a hot and painful blush of redness surrounding this, and hence the term. In consequence of the matrix of the nail, in many cases, being primarily and permanently affected, shedding of the nail need be no unlooked-for event.

2. A somewhat more serious action is found to pervade the subcutaneous areolar tissue, as well as the skin; bearing the same analogy to the former affection, as phlegmonous erysipelas does to erythema. It is usually caused by a puncture, laceration, or other wound; with or without inoculation of irritant matter. The swelling, heat, redness, tension, and pain are greater; and there is a proneness towards acute suppuration. Treatment must be proportionally active; copious leeching, at the sides of the finger; or free puncturing of the affected parts; active constitutional antiphlogistics; fomentation and poultice; early incision, if need be, as in phlegmonous erysipelas—not waiting till diffuse suppuration has formed (*Principles*, 3d Am. Ed. p. 372).

3. The worst form is the most deeply seated; and, unfortunately, not the least frequent in occurrence. The action originates in the deep fibrous textures; sometimes, there is every reason to believe, in the periosteum, or immediately exterior to it. Pain is excruciating from the first. For days and nights the patient may enjoy not a moment's sleep, or respite from suffering. Tension and throbbing are early and intense; so are the swelling, heat, and redness. The back of the hand, and sometimes part of the forearm, are red and greatly engorged with serous effusion. Matter forms early in the finger; deep and confined, and consequently with aggravation. The constitution labors under inflammatory fever, often severe. At the outset, active antiphlogistics, locally and generally, are to be employed—copious leeching, fomentation and poultice, purging and antimony—with the hope of averting suppuration. Failing these, there is no relief to suffering, and no means of averting serious destruction of texture, but by early and free incision. It seems harsh practice to lay a finger open throughout almost its whole extent, on the palmar aspect; but, soon after the infliction of such a wound, pain will rapidly abate, and in a short time the patient will probably be in a deep unconscious slumber. Free outward suppuration takes place; the swelling abates; bones, joints, and tendons are saved; and the finger recovers, tediously it may be, but well. Withhold the incision, and there comes no relief but on spontaneous evacuation of the matter; and then bones are found carious or necrosed, joints are opened into, tendons are sloughing or have sloughed;

Fig. 126.



Danger of delaying incision, in the worst form of paronychia, exemplified. Thumb lost in consequence.

Fig. 127.

The illustration carried farther; after maceration.

the fingers may recover, in some sense, but are stiff and useless; more frequently, amputation is demanded sooner or later.

In both of the more severe forms, extension to the palm is by no means unfrequent. The same principles of treatment are to be fulfilled there as in the finger. But in incising, care must be taken to avoid, if possible, wound of the palmar arch.

Sometimes the virulent form of paronychia is limited to the distal joint of the finger. Then exfoliation of the corresponding phalanx is extremely probable. But, fortunately, the whole bone seldom comes away; a portion at the articulation remains; and, from this, regeneration may take place, with but little ultimate deformity.

Onychia.

This term denotes a diseased condition of the matrix of the nail; the result of a chronic inflammatory process, inducing intractable ulceration. The first indications are pain, swelling, and redness around the root of the nail; and, on pressure being applied, an ichorous discharge oozes from beneath the cuticle at this part. The nail separates more and more, and is ultimately detached; disclosing an angry ulcer, of irregular margin and tawny surface, surrounded by dusky redness, emitting a thin fetid discharge, and the seat of intense pain. Usually, an aborted reproduction of the nail protrudes from the upper part of the sore.

The indications of treatment are simple. To pluck away the stunted nail; by an escharotic—as the potassa fusa or nitric acid—to destroy the morbid texture; and, on separation of the slough, to make such application to the sore as its varying state may seem to require. In almost all cases, however, local treatment is not alone sufficient. The general health will be found greatly disordered. Alteratives and tonics are necessary; and, in some cases, a mild mercurial course is followed by the best effects.

Certain cases are very obstinate, and to such the term *Onychia maligna* has been applied; inappropriately, however, inasmuch as the sore, however unmanageable, possesses none of the characters of true malignancy; in such cases, the escharotic application must be made with unusual intensity; or, under chloroform, the diseased parts may be shaved off with a knife; and if, by this means, a satisfactory granulating surface cannot be obtained, it is well at once to perform amputation of the phalanx. This summary procedure is still more especially indicated, in those examples of the inveterate form in which the bone has become involved.

Onyxis.

Onychia occurs in both toes and fingers. Onyxis is usually confined to the former. By this term is understood a faulty condition of the margin of the nail, original or secondary; causing, or connected with, an irritable fungous sore of the soft parts. The root of the nail not unfrequently is surrounded by a red and swollen integument. The

general matrix is sound; but, occasionally, onychia follows on the minor affection.

Whether the nail have been originally to blame, or not, it is very important to remove its injurious contact with the angry sore beneath. For this purpose, either mild or rude measures may be employed; the former in the first instance. The nail is softened, and, having been scraped thin, has its edge gradually and gently elevated above the fungous granulations; and then there is interposed a layer of soft lint, or other suitable substance. The nail having been thus permanently elevated, the freed sore abandons its irritable character, and may be brought to heal under the ordinary applications. But, failing such measures, partial evulsion of the nail is to be had recourse to; a harsh seeming remedy, but very effectual. The nail having been softened and thinned, as before, the blade of a strong sharp-pointed scissors is run up from the point to the root; the nail is severed at that part by one stroke; the isolated portion of nail, usually about a quarter of the whole, is then laid hold of by strong dissecting forceps, one blade of which is pushed beneath, and, by a sudden wrench, evulsion is effected. Unless under chloroform, the pain is great, though momentary. Hot poultice or water-dressing is applied. A healthy character of sore, generally, soon appears, and healing is not long delayed.

Contraction of the Palmar Fascia.

The whole aponeurosis may be rigidly contracted; or a portion only, connected with one or more fingers. When the whole is involved, all the fingers are rigidly bent, and the hand consequently is not only much deformed, but almost entirely useless. The disease is most frequent in those who use the fingers much, and is but little amenable to treatment. Obviously, the change depends on a chronic inflammatory process affecting the aponeurosis; and is to be met in its early stage with leeching, mercurial friction, local use of iodine, &c. The partial form is common in those of the better ranks, who are much given to horseback exercise and other field sports. In some of these cases, amendment may follow subcutaneous division of the affected portion of fascia, the finger being subsequently straightened by the application of a splint and bandage.

Spastic flexion of the thumb not unfrequently occurs during childhood, in connection with intestinal irritation. It is treated by the application of splint and bandage, while, by purgatives and alteratives, the primæ viæ are rectified.

Those who write much are liable to troublesome spasm of the thumb, sometimes called *writers' cramp*. Treatment consists in rest of the part, with tonics constitutionally and locally.

Tumors of the Metacarpal Bones and Phalanges.

Exostosis may occur, but is rare. Treatment is seldom, if ever, required, the affection proving but little troublesome. *Osteo-cystoma* (*Principles*, 3d Am. Ed. p. 454) is more common. Its treatment depends upon the bulk. If small, it is incised; and, on pressure being subsequently

Fig. 128.

The Large Enchondroma referred to. a. A section made to show structure. b. The ulcerated surface, whence the bleeding came. For the microscopic characters, see *Principles*, Am. Ed. p. 305.

applied, contraction and healing will probably ensue. Or, if need be, a seton is passed, and temporarily retained; and thus the desired obliteration is effected. Those of large size, involving the whole periphery of the bone, warrant amputation of the affected part. *Enchondromata* (*Principles*, 3d Am. Ed. p. 453) have here their most frequent site. If small and external, the tumor is dissected off, and the bone left uninjured. Those which affect the whole bone require amputation. Generally, the tumors are not single; yet, usually, we are able to save a part, and sometimes the greater part, of that most useful organ, the hand; the avowed non-malignancy of this tumor admitting of incisions being made very close to the morbid formation. Sometimes, however, the size and connections of the tumor are such as to demand amputation of the whole hand. Lately, I had occasion to remove one of great size, weighing fourteen pounds. From the apex of the tumor, repeated and serious hemorrhage had taken place; and, it was satisfactory to find, on a careful examination after injection, that the blood had escaped from ulcerated openings in large superficial veins, not from any degeneracy in the structure of the tumor itself.

Other Diseases of the Metacarpal Bones and Phalanges.

These bones are especially liable to the inflammatory casualties—ulcer, caries, and necrosis. The ordinary treatment is to be put in force. When, as a last resource, amputation is unavoidable, one general rule should never be forgotten, viz.: that it is our duty to save as much as circumstances will possibly permit; a portion of the original hand being a much better organ of prehension, than any artificial substitute, however ingeniously constructed.

Fig. 129.

Scrofulous Necrosis of Finger; macerated; after amputation.

Frequently, in consequence of whitlow, or inflammatory action traumatically induced, it may be in our power to retain a finger, but not without complete anchylosis of all its articulations. And, under such circumstances, it comes to be a question whether it were not better to amputate such a member at once, before anchylosis and cicatrization have occurred; thereby not only shortening the cure, but also rendering the hand much more useful, especially in the case of the laboring man, by whom a stiff finger is felt to be constantly in the way. I believe that the question is to be answered in the affirmative—in favor of

amputation. The thumb, however, is in all circumstances to be preserved, if possible. Rigid or not, it proves extremely serviceable.

Another question arises in the case of a hopelessly diseased metacarpal bone, whose corresponding finger is perfectly sound. May the metacarpal bone be removed alone, or must the finger be taken along with it? The latter is the preferable practice. The finger left without its metacarpal bone is worse than useless.

Two or even three metacarpal bones, when carious, may be removed, with their corresponding fingers. The operation is preferable to amputation of the whole hand. For the paramount general rule of saving as much as possible, should ever be respected in such cases. Some years ago, in amputating a metacarpal bone, its base was found carious, and also the corresponding portion of the carpal range. The latter diseased part was removed by means of a gouge; and a most satisfactory cure resulted.

Hypertrophy of the Fingers.

This rare departure from ordinary nature, has been occasionally noticed in young people; affecting one or more fingers; originating from no assignable exciting cause; consisting of true hypertrophy of all the textures—bones, joints, tendons, skin, and nails; and accompanied with more or less deformity, and loss of function. Firm and continued pressure may moderate the unnatural growth. If not, inconvenience may be mitigated by amputation—partial or complete.

Congenital Deformities of the Hand.

Supernumerary fingers are usually attached, not by articulating apparatus, but by ordinary integumentary tissues. Their amputation is accordingly very easily effected.

Webbed fingers are often hereditary; and in some parts of the country are held in esteem. Should their amendment be wished, that is obtained by division of the abnormal band; great care being taken, during cicatrization, to prevent reunion of the opposed parts. And, for this purpose, interposition of dressing is not enough; it is essential, as in the case of burns (*Principles*, 3d Am. Ed. p. 645), to make constant and considerable pressure on the angle of union, at the knuckles; and this is done by means of a piece of cord or tape, placed and retained there.

Club-hand, a condition of the hand analogous to club-foot, occasionally occurs. It is remediable, at an early age, with or without the aid of tenotomy, by the wearing of suitable apparatus. And to the machinist, the management of such cases is usually intrusted. It is also the province of that profession to atone, by mechanical substitutes, for *deficient development* of the hand or fingers.

Vogt, de Paroncychia, Viteb. 1803. Wardrop, an Account of some Diseases of the Toes and Fingers, &c. Med.-Chir. Trans. vol. v. p. 129. Duteil, Dissertation sur la Panaris, Paris, 1815. Craigie, Pathological and Practical Observations on Whitlow, Ed. Med. and Surg. Journal, April, 1828, p. 255. Dupuytren, Clinique Chirurg. t. i. art. 1.

CHAPTER XXII.

DISEASES OF THE ARTICULATIONS OF THE SUPERIOR EXTREMITY.

Disease of the Shoulder-Joint.

THIS joint, like others, is liable to the ordinary affections of such parts. But it is, perhaps, especially liable to disorganizing disease, involving all textures ultimately, and usually originating in the cancellated tissue of the head of the humerus. To this the term *Omalgia* was formerly applied; very inappropriately, because apparently inferring that the disorder was of the nature of irritation, or neuralgic, not structural and inflammatory. It may occur at any age; and very frequently its origin is connected with external injury. One of the first and most prominent symptoms is wasting of the deltoid; ultimately giving a prominence to the acromion. The arm is incapable of exertion; and pain in the joint is increased by motion, especially when the arm is raised. Bending takes place at the elbow; and the limb projects awkwardly from the body, feeble and wasted, and apparently increased in length. The shoulder simulates luxation. And, at length, this result may actually occur; disorganization of the joint having become complete. The constitution does not fail to suffer in sympathy with the progress of this grave disorder. Swelling, as usual in primary affections of the hard tissues, is of secondary occurrence, and is seldom very great; evacuation, by external opening, being soon attained by nature's own effort.

[Paralysis of the deltoid muscle, from a blow received upon it along the course of the musculo-spiral nerve, whereby the latter is injured, may simulate more serious organic disease. The muscles about the shoulder waste, the arm droops, motion is impaired and painful. A careful inquiry into the history of the case, and an attentive examination of the local condition and of the state of health of the patient, will lead to a correct diagnosis. The *prognosis* depends very much upon the severity of the injury. The *treatment* consists in the use of the cold douche, stimulating frictions, blistering, the endermic employment of strychnia, electricity, &c.—ED.]

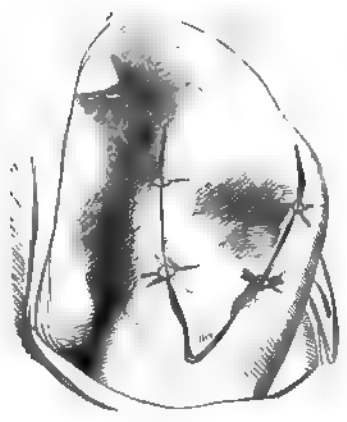
Treatment is to be conducted on the general principles formerly explained (*Principles*, 3d Am. Ed. p. 515). But, true caries having been established, with an open condition of the joint, it becomes very improbable that spontaneous cure will take place; and usually the general health is then seriously and obviously on the decline. In such circum-

stances, the diseased parts must be removed by operation, by amputation of the limb, or by resection of the joint. The latter operation is obviously preferable, when not contraindicated (*Principles*, 3d Am. Ed. p. 502).

Resection of the Shoulder-Joint.

To expose the articulation, a flap may be made from the outer and forepart of the deltoid; or a single incision may be placed longitudinally, over the outer aspect of the joint, the knife being entered below the acromion, and pushed at once down to the head of the humerus. In many cases, the latter mode is quite sufficient; and, being less severe, is to be preferred. The knife and finger having penetrated the joint, the remaining portions of the retaining apparatus are divided—more especially the muscles inserted into the tuberosities of the humerus, towards which the finger is the best guide—and the diseased head is then made to show itself, and project through the wound; the limb being with this view brought forcibly across the thorax. By a saw abbreviation is made to the required extent. The glenoid cavity is then examined; and, if found diseased, the affected part is taken away, by means of cross cutting pliers, or by a gouge. Bleeding having been arrested, the parts are accurately reponed; the wound is brought together, and the limb is retained steadily in a convenient posture. Healing by granulation is to be expected; with the formation of an artificial joint, more or less competent to assume the functions of the original. Often it proves, in all respects, an admirable substitute. And thus many useful limbs may be retained, under circumstances, which, but a few years since, would have called for nothing short of amputation.

Fig. 130.



Flap, placed in position, after resection of the shoulder-joint.

The operation may also be required, primarily, on account of injury done to the bone, as by gunshot wound.

[It has seemed necessary, in some instances, to make much more extensive ablations from this part of the body, including even the whole scapula and clavicle, together with the arm, or subsequently to the removal of the latter.

In 1837, Dr. Mussey, now of Cincinnati, removed the entire scapula and clavicle at one operation, having six years before removed the humerus of the same person at the glenoid cavity. In 1838, Dr. Geo. McClellan, of this city, amputated the whole of the upper extremity at one operation, including the arm, scapula, and clavicle; the latter being sawn through at its junction with the sternum—the sterno-clavicular articulation not being opened. In 1841, Rigaud, of Strasbourg, removed an arm at the shoulder-joint; and, in the following year, the

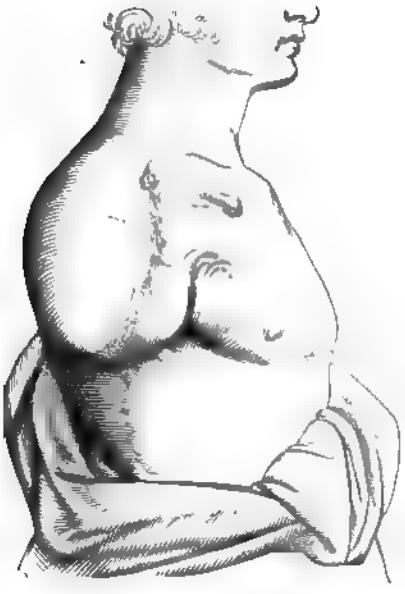
disease having implicated the scapula, he removed the whole of this bone, together with the outer extremity of the clavicle. In 1847, Mr. Fergusson removed the whole of the scapula and a part of the clavicle; three years after the arm had been taken off at the shoulder.

These operations, with the exception of that of Rigaud, which was done for a gunshot injury, were performed for chronic diseases involving the bones. Besides these, numerous smaller operations have been done in every country.

It were hardly necessary to describe the mode of proceeding in such cases, the plan of operation being simple enough. In the case operated on by Dr. Mussey, the tumor which formed upon the shoulder was round and prominent, measuring horizontally over the summit, from the anterior to the posterior margin of its base, fourteen inches, and from the upper to the lower margin of its base, ten inches. The integuments were dissected from the clavicle, the bone disconnected from the sternum; its sternal end elevated and detached from the subclavius muscle, so as to admit of the finger of an assistant being passed under it to secure the subclavian artery. Having tied this vessel, Dr. M. divided the accompanying vein, when a bubble of air entered it, which caused the patient instantly to swoon, and he was roused with much difficulty. "The immense wound, with flaps of seven or eight inches in extent, united by adhesion, and became consolidated, *literally* without the formation of a teaspoonful of pus. In less than three weeks, the patient was dismissed, and he rode home in a stage-coach between thirty and forty miles," (*Chelius*, South's Ed. Philad., 1847, vol. iii. p. 765.)

Mr. Fergusson's patient was suffering from caries of the scapula. His

[Fig. 131.]



[Fig. 131. Plan of Mr. Fergusson's Operation; the black lines representing the incisions.]

[Fig. 132.]

[Fig. 132. Appearance of the Scapula and Acromial end of the Clavicle of Mr. Fergusson's patient.—Ed.]

operation is described in his *Practical Surgery* (Am. Ed. 1853); and is illustrated by the accompanying drawings. (Figs. 131, 132.)—Ed.

[See Chelius, vol. iii.; Fergusson's Practical Surgery; McClellan's Principles of Surgery; American Journal, vol. xxi. 1837.—Ed.]

Resection of the Elbow-Joint.

Few affections are more common than articular disease at the elbow; and, not unfrequently, it advances to disorganization, with or without strumous complication. To this joint, more than any other, the operation of resection is applicable. Care being always taken to select the case according to the ordinary tests (*Principles*, 3d Am. Ed. p. 502), lest, resection failing, amputation become necessary, and we discover, when too late, that the patient, who could have stood one operation well, must inevitably sink under both. The patient having been placed prone on a table, or seated with his back to the surgeon, and with the arm extended and held by an assistant, the joint is exposed from behind, by cutting, so as to form flaps; and the flap may be single, double, or quadruple;

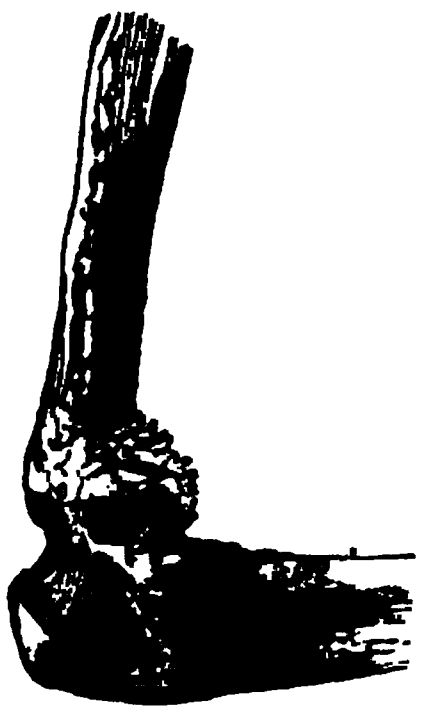
In freeing the soft parts from the inner condyle, and reflecting them over it, care is necessary to keep the ulnar nerve free from harm. The

Fig. 133.

Incision marked for resection of the Elbow.

insertion of the triceps having been cut across, on bending the arm the olecranon is made prominent; and this, having been separated from its connection with the soft parts, is removed by saw or pliers, to the requisite extent. The joint can now be very readily dislocated; the condyles of the humerus are isolated and sawed off; and the upper part of the radius, usually, is also removed—the saw being preferred, to avoid bruising of the softened bone. Removal of the olecranon by pliers is mainly to facilitate disarticulation; afterwards it is usually necessary to saw away so much more of the ulna as may seem hopelessly diseased. Should any suspicious portions appear at or near the cut surfaces, the gouge may be directed against them. Bleeding having been arrested, and the wound brought loosely together, the limb is secured in a slightly bent posture. Suppuration and granulation follow; the wound slowly closes; and an artificial joint by ligamentous structure is ultimately constructed—often of remarkable usefulness.

Fig. 184.



Caries of the Elbow; mainly affecting the condyle of the humerus. The vegetative effort around the carious surface well exemplified.

Resection of the Wrist.

It were easy enough to remove by operation the articulating ends of the radius and ulna, and to gouge out the affected parts of the corresponding surfaces of the carpal bones; but the proceeding is not found to succeed. And, consequently, when this joint is deemed irreclaimable, amputation is preferred. Fortunately, a vast proportion of the cases of scrofulous disease of this joint, in adolescents, recover under use of cod-liver oil, and general antistrumous treatment—with or without anchylosis.

Moreau, Résection des Articulations, &c. Paris, 1803. Roux, de la Résection des Portions d'Os, &c. Paris, 1812. Crampton, Dub. Hosp. Reports, vol. iv. 1827. Velpeau, Nouv. Elém. de Méd. Opérator, tom. i. Syme on Excision of Joints, Edin. 1831.

CHAPTER XXIII.

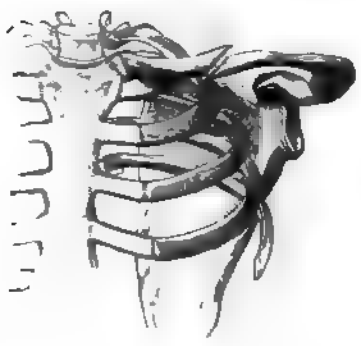
INJURIES OF THE SUPERIOR EXTREMITY.

Fractures.

Fracture of the Clavicle.

The clavicle is frequently broken, and usually by violence applied to the acromial extremity, as by falls on the shoulder. The fracture is generally oblique, and near the centre of the bone. The limb is powerless, the part is pained and swollen, attempted movement aggravates the pain, and the shoulder is both sunk and drawn towards the sternum. Displacement is caused by depression of the lower fragment, whereby the sternal portion is made very prominent, causing palpable deformity, and seeming to be out of place, though truly remaining nearly *in situ*, the action of the pectoral and sterno-mastoid muscles nearly neutralizing each other, and the bone being also steadied by the costo-clavicular ligament. The acromial portion is dragged downwards by the weight of the arm, and forwards and inwards by the action of the subclavius, the attachment of this muscle to the first rib being then the fixed point.

[Fig. 185.]



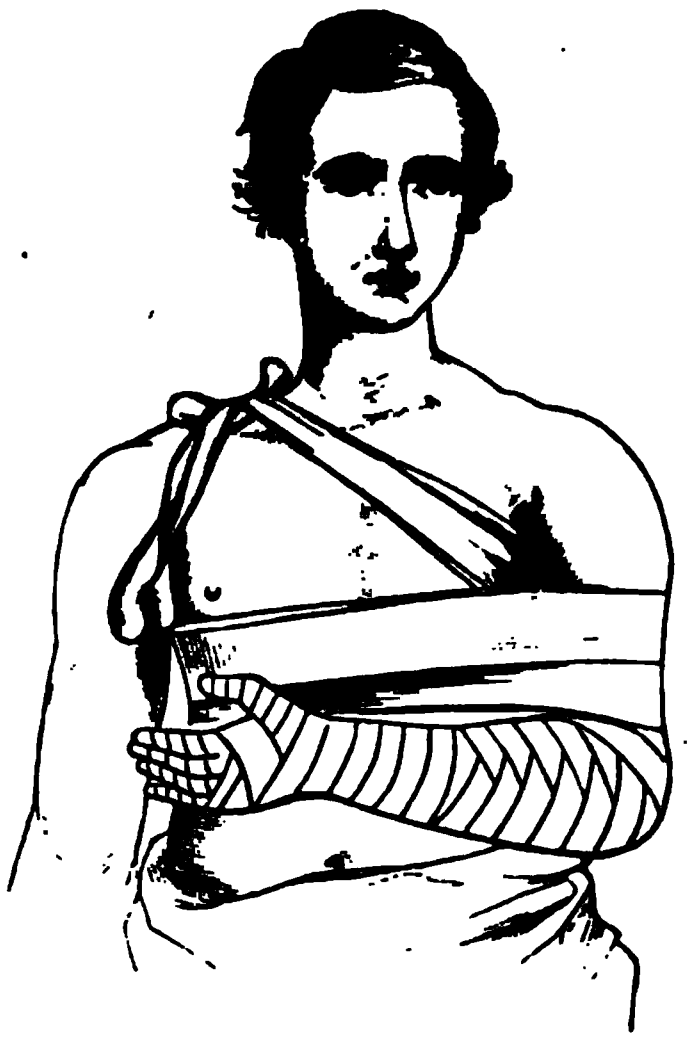
[The ordinary site of Fracture of the Clavicle. (From Ferguson.)—Ed.]

[When the point of fracture is near the acromial extremity, where the bone is broad, there may be no displacement at first, and but little, perhaps, at any subsequent period. This is owing, partly to the breadth of the bone, and partly to the existence of ligamentous fibres, unruptured by the violence, which hold the fragments in apposition. Frequently, however, unless the accident is recognized and properly treated at first, some sudden movement, as in throwing a stone, or lifting any heavy article, separates the fragments and reveals the true nature of the accident, at the expiration of a few days. When there is doubt, therefore, as to the existence of fracture, the patient should be carefully watched, or a fracture dressing be applied at once.—Ed.]

The indications of treatment are plain, but unfortunately not very

easily fulfilled. They are to raise the acromial portion to the same level with the sternal, to retain it there, and at the same time to keep the shoulder removed from the sternum, so as to prevent displacement inwards, and consequent "riding" of the ends of the bone. Many and complicated are the means devised for this end. The simplest, most easily obtained, and not the least efficient, are as follows: A wedge-shaped pad is placed in the axilla, sufficiently large to occupy that cavity completely. The best pad is made of horse-hair, covered with soft leather, but any temporary substitute may be taken at the first dressing. By means of a shawl or large handkerchief, within which it is placed, the pad is securely lodged in the axilla, and, by tying the ends over the opposite shoulder tightly, elevation of the shoulder, and consequently of the acromial portion of the clavicle, is effected; and the latter indication is farther contributed to, by placing the forearm in a short sling, well tightened over the elbow. To maintain extension of the bone is more difficult. Carry a bandage, handkerchief, or other ligature, across the chest, including the lower part of the arm on the injured side, arranging it so that the arm shall be both approximated to the chest, and carried well backwards, making the humerus a lever, which, acting on the pad as a fulcrum, forces the shoulder outwards. And, if need be, maintain approximation of both scapulæ by means of a figure of 8 bandage, so as to complete and secure the readjustment. It is well also to relax the sterno-mastoid by attention to the position of the neck, for sometimes this muscle would seem to succeed in elevating the sternal portion slightly. Retention will be more easily effected in the erect or semi-erect than in the recumbent posture. The knot over the shoulder may gall the patient, and, to prevent this, the skin should be well protected by suitable padding. The application of pressure over the site of fracture can be productive only of evil. The integuments may be induced to slough, and an injury, originally simple, may be rendered compound. In females, for obvious reasons, the treatment is to be conducted with especial care.

Fig. 186.



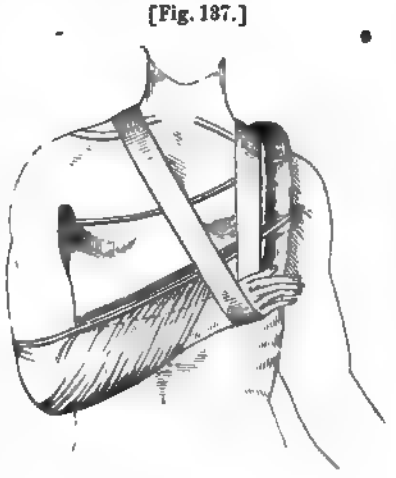
Simple Bandaging suitable for Fractured Clavicle. The sling omitted.

[We have seen no apparatus for the treatment of fracture, which answers the indications so well as that suggested by Dr. Fox, of this city. It is in common use here, and we have repeatedly seen cures effected by it without any perceptible deformity; indeed, if proper care be exercised, the occurrence of deformity is the exception.

The apparatus is composed of a *ring*, made of muslin, and pretty firmly stuffed with hair or cotton, to encircle the uninjured shoulder; a

firm *wedge-shaped pad*, about half as long as the humerus, having a piece of strong tape attached to each extremity of its base, for the purpose of securing it to the *ring*, after it has been placed in the axilla; and a *sling*, or pouch, of strong muslin, closed at one end and open at the other, in which the forearm is placed, the closed end receiving the elbow; this sling has sewed to each of its carpal flaps a piece of tape, and another piece to the humeral end, by which means it is secured to the ring. The accompanying figure will exhibit the *modus operandi* of this apparatus. A moment's inspection of the drawing shows how well this appliance fulfils the indications of treatment, and how readily the acromial end of the fragment can be acted upon by tightening or loosening the tapes which secure the sling to the ring; how exposed the broken bone is for the application of remedial agents and how comparatively free and unincumbered is the chest, and the mammæ in females.

[Fig. 137.]



[Dr. Fox's Apparatus applied. (From Sargent's Minor Surgery.)—Ed.]

Within the last few years, we have had the opportunity of testing a plan, recommended by a French gentleman, M. Guillou, and published by him in *L'Abeille Médicale*, October, 1847. The pieces composing the apparatus are numerous, but the plan consists essentially in fixing a pad in the axilla of the injured side, bringing the arm to the side, and securing the forearm *behind the back*, by suitable means. Fox's apparatus, applied somewhat differently from the ordinary way, would answer very well to accomplish the intention of M. Guillou's method. We have tried this in three cases of fracture of the clavicle, and have been perfectly satisfied with its operation. Our friend, Dr. Hollingsworth, has lately informed us that he has recently employed it, and with equal satisfaction. We believe that either of the methods now described is much superior to others in common use.

For farther details concerning these apparatuses, see Sargent's Minor Surgery.—Ed.]

Fracture of the Body of the Scapula.

The body of the scapula may be broken across, by violence directly applied, or even by muscular force alone. There is but little displacement, or deformity. The part is pained, swollen, and limited in voluntary motion, and, while movement is made, crepitus can be distinctly felt by the hand placed flatly on the part. In treatment, it is sufficient to restrain motion, by wearing the arm in a sling, and by having a

[Fig. 188.]

[The ordinary position of Fractures of the Body and Acromion process of the Scapula. (From Fergusson.)—Ed.]

broad flannel bandage passed tightly over the chest, including the fractured bone.

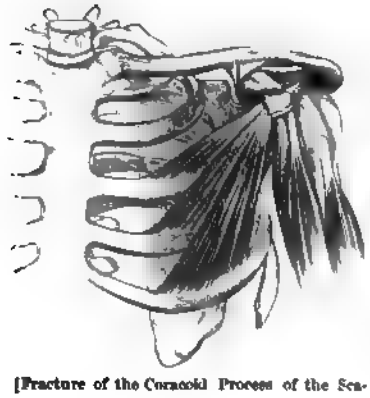
Fracture of the Acromion.

The acromion process may be detached from the spine of the scapula, by direct violence. There are pain, swelling, and loss of power, and a depression can be felt at the injured part, in consequence of the fractured portion being drawn downwards on the head of the humerus, by the action of the deltoid muscle. At the same time, the clavicle is drawn downwards and forwards on the coracoid process, by the subclavius, and by the action of the deltoid and pectoralis major muscles overcoming that of the trapezius and sterno-cleido-mastoid. Crepitus is not felt on rotating the limb, until the arm has been raised, for then only can the fractured portions be brought into apposition. In treatment, it is sufficient to raise the arm fully by means of a sling, and to prevent motion by suitable bandaging to the trunk. No pad should be placed in the axilla, otherwise the hiatus between the fractured portions will probably be increased. Union is generally by ligament.

Fracture of the Coracoid Process.

This injury is also the result of direct violence. The fractured portion is displaced downwards, by the action of the coraco-brachialis, pectoralis minor, and biceps muscles. There are pain and swelling of the part, with loss of power in the limb; and crepitation is felt on rotating the limb, after the forearm has been flexed, and the arm carried across the chest, in order to relax the muscles connected with the process, and so to permit replacement of the fragment. In treatment, it is sufficient to make this relaxation permanent. The fingers of the injured limb are made to touch the shoulder of the opposite side, and that position is secured by bandaging.

[Fig. 189.]

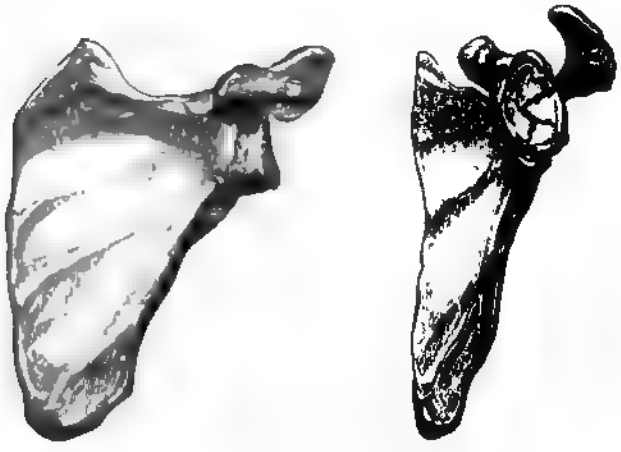


[Fracture of the Coracoid Process of the Scapula. (From Fergusson.)—Ed.]

Fracture of the Neck of the Scapula.

This accident, separation of the glenoid cavity and coracoid process from the body of the bone, is the result of great and direct violence, and, like the preceding, is of rare occurrence. Sometimes there is mere separation of the above-named parts; more frequently, the glenoid cavity is fissured and broken up. The detached portion of the scapula

[Fig. 140.] [Fig. 141.]



[Figs. 140 and 141.—Fractures of the Glenoid Cavity, and of the Neck of the Scapula in various directions. (From Ferguson.)—ED.]

is retained in close contact with the head of the humerus, by the long heads of the biceps and triceps muscles; and both the fragment and the head of the humerus are displaced downwards and forwards into the axilla, by the action of the subscapularis and pectoralis major, and of the other muscles connected with the upper part of the humerus. The appearances are very like those of dislocation; there is the same flattening of the shoulder, with palpable prominence of the acromion, and vacancy beneath it; and the head of the bone may be felt plainly in the axilla; at first, too, there is no crepitation; and the limb is somewhat lengthened. But, by very gentle effort, the head of the bone may be replaced—a thing very unusual, if not actually impracticable, in dislocation. Then crepitus may be plainly felt, on rotating the arm with one hand, while with the fingers and thumb of the other, pressure is made deep in the axilla and on the coracoid process; then, too, flattening of the shoulder is made to disappear; but, on ceasing from manipulation, deformity and displacement are speedily reproduced. In treatment, a pad having been placed in the axilla, the shoulder is raised and the forearm supported by a sling.

Fracture of the Neck of the Humerus.

1. *Fracture at the Anatomical Neck.*—Occasionally, the bone gives way at this point, but not so frequently as below the tubercles. The injury is the result of direct violence, and intracapsular. There is but little displacement or deformity; the lower fragment being retained in its ordinary position by the muscles inserted into the tubercles. The chief signs are pain, impairment of motion, and crepitus. Sometimes impaction takes place, the upper fragment being driven into the cancellous tissue of the lower; then the signs are unusually obscure; but the circumstance is favorable to osseous and speedy reunion. When there is no impaction, the detached head of the bone may become necrosed; and in that event, inflammatory disorganization may be expected, for extrusion of the sequestrum. Treatment of this form of injury consists mainly in preserving quietude in the parts.

2. *Fracture, by Separation of the Epiphysis.*—This also is the result of direct violence. The head of the bone remains in its place; while the shaft is carried forwards on the coracoid process, by the action of the muscles inserted into the bicipital ridges. There is little or no flattening of the shoulder; the head of the bone can be felt *in situ*, motionless on rotation; the end of the shaft, directed obliquely upwards and inwards, is felt and seen projecting on the coracoid process; the arm is shortened, with the elbow awkwardly projecting from the side; by slight extension and coaptation adjustment is readily effected, and then crepitus is emitted on rotation. The most characteristic sign is the remarkable prominence over the coracoid, produced by the resting of the end of the lower fragment there. Sometimes impaction, however, occurs; the lower fragment being driven into the upper; and this necessarily obscures the signs of injury.

In treating this form of fracture, a pad is placed in the axilla; by two splints of pasteboard, wood, or leather, placed one on the outside, the other on the inside of the limb, retention is secured;[1] the forearm is supported by a sling; but the elbow is left free and pendent. Were pressure to be made on the elbow, by adjustment of the sling in the ordinary way, displacement of the lower fragment would inevitably be reproduced; whereas, by following an opposite course, a certain degree of permanent extension is maintained on the humerus, which is of use in preserving apposition.

3. *Fracture of the larger Tubercle.*—This is the result of direct violence. The joint is preternaturally broad; the acromion projects somewhat; the deltoid is slightly flattened; the arm is powerless as to elevation; and two hard swellings are to be felt—one, internal to the coracoid process, the head of the bone—the other, beneath the acromion, the detached tubercle. Treatment is as in the previous injury; with the whole forearm supported.

4. *Fracture at the Surgical Neck.*—This is also the result of direct violence. The upper fragment remains nearly in its place, moved

[1] Sometimes the internal splint may be dispensed with.

slightly upwards and outwards by the action of the muscles inserted into the tubercles. The upper end of the lower fragment, or shaft, is drawn upwards and close to the side by the muscles inserted into the bicipital ridges; while its lower end, at the elbow, is abducted by the action of the deltoid on its point of insertion. The appearances consequently are—no flattening of the shoulder, on the contrary rather a fulness; the head of the bone felt plainly *in situ*, motionless on rotation; the upper end of the fragmental shaft felt displaced on the side, and a depression plainly perceived at a corresponding point in the external outline of the limb; the arm shortened and powerless; the elbow abducted; crepitus, on rotation after adjustment. In treatment, a full-sized wedge-shaped pad is placed in the axilla; splints are applied along the limb, the outer one extending from the top of the shoulder to the external condyle, the inner from the internal condyle to the axilla; the forearm is supported by a sling; and again the elbow is left free and pendent.

5. *Fracture with Dislocation.*—Fracture at either neck may occur, in consequence of great and direct violence, and be accompanied with dislocation of the head of the bone. Fortunately, the combination is of exceeding rarity. The symptoms are necessarily complicated. But the diagnostic mark is sufficiently plain; the head of the bone is felt lodged in the axilla, not moving along with the shaft in rotation. On readjustment, too, characteristic crepitus may be detected. Treatment is difficult. An effort is to be made, by direct manipulation, to reduce the head of the bone if possible—of course, under chloroform; and if this be accomplished, then the case, having been reduced to one of fracture, requires the ordinary retentive treatment after due coaptation. Or, failing in direct coaptation, the fracture may be reduced and arranged tightly in splints, so as to admit of reduction of the dislocation by extension being attempted in the ordinary way. But, if the luxation remain, notwithstanding every warrantable effort to remove it, then it were well to adjust the end of the shaft into the vacated glenoid cavity, and to retain it there for a time by splints, bandaging, and a pad in the axilla. The broken end becomes rounded off, assuming an articular character and function; and the new joint is likely to prove more useful, than if reunion had been effected upon the displaced fragment in the axilla.

Fracture of the Shaft of the Humerus.

1. *Below the Bicipital Ridges, and above the Insertion of the Deltoid.*—Here the position of the fragments is the reverse of what results from solution of continuity at the surgical neck of the bone. The upper fragment is drawn inwards, to the side, by the muscles inserted into the bicipital ridges; while the lower is displaced outwards and upwards by the action of the deltoid, causing an abnormal prominence at this part of the arm—immediately above the insertion of the muscle—with an inclination of the elbow to the side. The characteristic signs are, the prominence just spoken of, shortening of the limb, crepitus on adjustment and rotation, and adduction of the elbow. Coapta-

tion having been effected, splints are applied, a pad is arranged so as to keep the upper fragment separate from the chest, the forearm is supported, and the whole is steadied and retained by suitable bandaging.

2. *At the Middle of the Shaft.*—At this point the nature of the injury is at once made apparent, by deformity, shortening, and powerlessness of the limb, with distinct crepitus emitted on the slightest manipulation. Reduction is easily effected, by extension and coaptation; and retention is maintained by splints; the forearm being also supported by a sling.

3. *At the Shaft above the Condyles.*—Here the solution of continuity is generally oblique; sloping down from behind forwards. And the appearances simulate those of dislocation of both bones of the forearm backwards. The lower fragment is drawn upwards and backwards by the action of the biceps, triceps, and brachialis anticus. The limb is shortened; and there is much bulging posteriorly. On extending the forearm, passively, the deformity is removed; but on resumption of the flexed posture, it is instantly reproduced; and by this test the accident is sufficiently distinguished from dislocation. Crepitus may be plainly perceived, on combining coaptation with rotation. When the line of fracture follows an opposite direction, passing obliquely upwards from behind forwards, the displacement is reversed; the lower end of the upper fragment projecting behind, while the upper end of the lower fragment is drawn upwards in front. Reduction having been effected, rectangular splints are applied on the inside and outside of the limb, and are retained by bandaging; the rectangular position of the forearm, being obviously advisable, in order to relax the displacing muscles—the biceps, triceps, and brachialis anticus. The splints, made of pasteboard, leather, or gutta-percha, should extend from near the middle of the arm quite to the wrist.

Diastasis may occur; separation of the epiphysis, with or without rotation. Reduction having been effected, by extension and coaptation, retention will be maintained best in the bent position.

Fracture at the Condyles of the Humerus.

1. *Of the Internal Condyle.*—The line of fracture is oblique to the shaft, detaching the internal condyle. During flexion of the forearm there is little or no displacement; but, on extension, the ulnar is drawn upwards and backwards, by the action of the triceps, there being no longer any efficient resistance to the coronoid process. The signs are —crepitus, on direct lateral movement of the injured part; obvious displacement of the ulnar in extension, and replacement of it by flexion of the forearm. In treatment, the limb is arranged in a rectangular position, as for fracture above the condyles. But from time to time it is expedient to undo the apparatus, and practise passive movement of the joint, lest stiffening should occur.

2. *Of the External Condyle.*—There may be little or no displacement in any position of the limb. But crepitus is to be felt; more especially during rotatory movement of the hand and radius. Treatment is as in the preceding case.

Fracture of the Ulna.

1. *Of the Olecranon.*—This may be the result of direct injury, by a fall on the elbow; or of muscular action only, in violent and sudden extension of the limb. Usually, ligament as well as bone is torn; and, consequently, the olecranon, detached from the shaft of the ulna, is displaced upwards by the action of the triceps; leaving a vacant space where prominence should have been, and placing the prominence an inch or more above its ordinary site. Voluntary extension is impracticable; flexion aggravates the signs of the injury. On extending the limb, the displacement is in a great measure removed; the two fragments are brought sufficiently near for satisfactory ligamentous union; and in treatment, therefore, it is enough to maintain the extended position, by the loose application of a splint on the palmar aspect of the elbow-joint. Very accurate approximation, indeed, is not desirable; a compact ligamentous bond of union being equally serviceable as an osseous one, and much less liable to a second disruption. Likewise, the risk of excessive osseous deposit is avoided, whereby the fragment might become inconveniently anchylosed, on its articulating aspect, with the end of the humerus.

[Fig. 142.]

[Drawing of a Specimen, exhibiting the usual site of fracture of the olecranon, and the ligamentous union which most commonly takes place. (From Fergusson.)—Ed.]

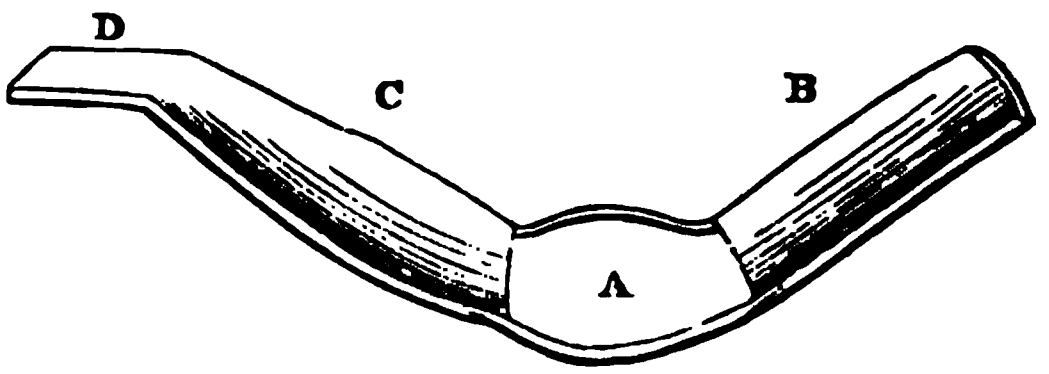
Compound fracture of the olecranon follows direct injury; and is invariably to be regarded as an accident of serious import; inasmuch as intense inflammation of the joint is very likely to supervene. And this tendency to serious evil we should never lose sight of, in treatment; endeavoring to prevent traumatic arthritis, if possible; and when it has occurred, doing our utmost to avert disorganization. Not unfrequently, with the best care, the joint suppurates, and is with difficulty saved by anchylosis. Sometimes even amputation is demanded.

[In such cases the splint recommended by Mr. Mayo, will be found very serviceable. It consists of two pieces of light wood or metal, grooved so as to afford a comfortable resting-place for the limb, and connected together by a firm rod on each side, as represented in the figure, leaving a space between them to receive the injured elbow. This connection may be movable, yet so arranged as to be fixable at any angle; but the elbow should be kept at least partially flexed, so that if anchylosis takes place, as it probably will, the patient will still possess a very useful limb.

In all cases where there seems to be a possibility of securing immediate union of the edges of the wound in the soft parts, this should be accurately closed by adhesive plaster, and a piece of lint wetted with white of egg or some other adhesive fluid, should be placed over the whole wound. This primary dressing should not be disturbed until it is

loosened by the discharge from beneath, or until evident signs of inflammation, requiring other application, shall have arisen.

[Fig. 143.]



[Mr. Mayo's Splint for Compound Fracture at the Elbow. B. The part for the upper arm. C. That for the forearm. D. Horizontal piece for the hand to rest upon. A. An intervening space for the elbow; the connecting bars curve outwards to afford more room. (From Lonsdale.)—Ed.]

If the injury be too severe to admit of simple treatment of this kind, and operative interference be deemed necessary, *resection* of the bones should be preferred to amputation of the entire limb, whenever practicable, as in the cases recorded by Sir Astley Cooper.—Ed.]

2. *Of the Coronoid Process.*—This rare accident is more likely to follow inordinate muscular action than direct injury. The ulnar is displaced backwards, by the unresisted action of the triceps; and the tendon of the biceps is rendered tense and unusually prominent by the bulging forwards of the trochlea of the humerus. The coronoid fragment is drawn upwards by the brachialis anticus. In treatment, the forearm is placed in a state of extreme flexion, and retained so by bandaging, so as to relax the displacing brachialis. Ligamentous union is expected, as in the case of the olecranon.

3. *Of the Shaft.*—The weakest point of the shaft of the ulna is a little below its centre; and there fracture is most likely to occur, from violence applied indirectly. The lower fragment is drawn to the radius, by the action of the pronator quadratus muscle; and consequently a depression is made there in the outline of the bones, until obscured by sanguineous and inflammatory swelling. There is neither pronation nor supination of the hand. By coaptation and rotation crepitus is readily perceived. In treatment, splints are applied on the palmar and dorsal aspects; each splint extending from the elbow to beyond the wrists, so as completely to command the latter articulation (*Principles*, 3d Am. Ed. p. 660). And, in order to prevent redisplacement by the pronator quadratus, a pad is placed on either aspect of the fractured part, of sufficient size to occupy the interosseous space fully, and so to offer a mechanical obstacle to undue approximation.

4. *Of the Styloid Process.*—This process may be chipped off, without other injury to the bone. There is little indication for treatment beyond rest of the part, until pain and swelling have subsided.

Fracture of the Radius.

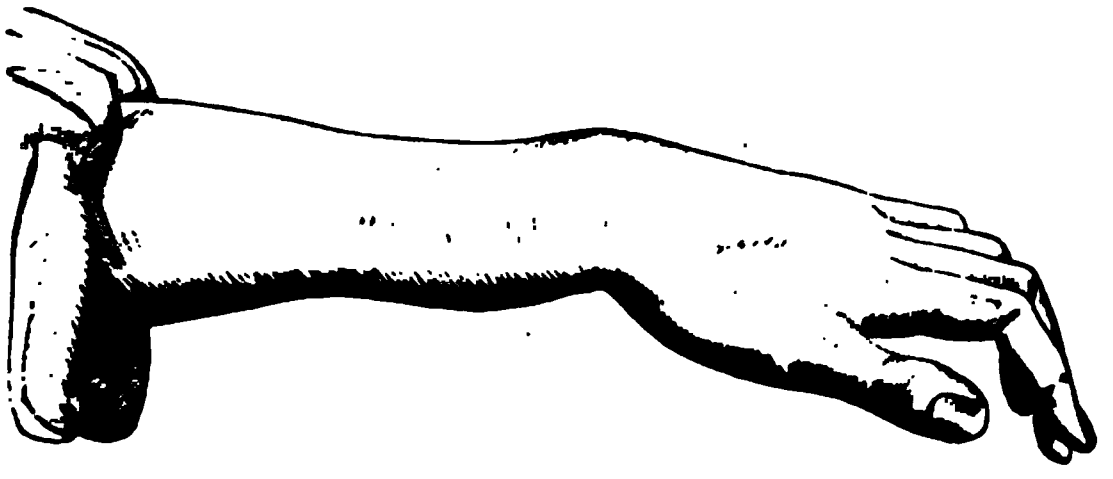
In this injury, it is convenient to observe, as an aid in diagnosis, that there is invariably abnormal pronation of the hand; whether the bone have suffered alone, or in company with the ulna.

1. *At its Neck.*—This is an accident of rare occurrence, and difficult diagnosis. The fragments are but little displaced, and crepitus has to be detected through a thick cushion of muscular substance. The lower fragment is tilted forwards and inwards slightly, by the action of the biceps; the upper is rotated somewhat outwards by the supinator radii brevis. Crepitus is to be sought for by firm pressure over the site of suspected fracture, while free rotation is made of the hand and forearm. In treatment, the forearm is flexed, and placed in the middle state between pronation and supination; long splints being applied on either aspect of the limb.

2. *Near the Centre.*—The radius very commonly gives way near its centre, from violence indirectly applied, as by falls on the hand, or by twisting of the forearm. And sometimes the accident is the result of muscular action alone. The unnatural degree of pronation is very marked and characteristic, the hand hanging awkwardly with the thumb directed downwards. The upper fragment is drawn upwards and inwards, by the action of the biceps; and there is an apparent enlargement of the upper half, with a diminution of the lower half of the forearm. The lower portion of the fractured bone is drawn towards the ulna, as well as completely pronated, by the action of the pronator quadratus. And the supinator radii longus assists powerfully, by tilting up the styloid process to which it is attached, in displacement towards the ulna. In treatment, the forearm is flexed, and placed in the middle state between pronation and supination; the interosseous pads are carefully adjusted; the long splints are applied on either aspect, projecting beyond the knuckles; the hand, bandaged separately to prevent congestion, is excluded from the retentive apparatus, and left pendent—so that by its weight it may counteract the displacing tendency of the long supinator, and separate the radius from the ulna at the point of fracture.

3. *At the Distal Extremity.*—This, too, is a very common result of falls on the hand. The radius being mainly concerned in the carpal articulation, to that bone the shock is chiefly and directly conveyed; and solution of continuity is extremely probable, more especially if any degree of twisting have been at the same time applied. The line of fracture may be either transverse or oblique. The upper fragment is displaced inwards by the pronator radii quadratus; causing an abnormal

[Fig. 144.]



[Illustration of the deformity produced by fracture of the distal extremity of the Radius. (From Fergusson.)—Ed.]

prominence on the palmar aspect, with a corresponding depression on the dorsal. There is pronation; and, on coaptation and extension, crepitus may be detected. The hand, following displacement of the lower fragment of the radius outwards, leaves the end of the ulna unusually prominent—as if dislocated. Luxation of the carpus, indeed, is in not a few cases closely simulated. The diagnostic marks are—detection of crepitus, mobility at the injured part, and in general non-continuity of the bone as evinced on rotation. But the case becomes obscure when the line of fracture is oblique, and *impaction* has occurred (*Principles*, 3d Am. Ed. p. 652). The lower fragment having received the sharp end of the upper into its cancellated tissue, the two become locked, continuity of the bone is apparently restored, and crepitus is felt but obscurely, if at all. When in doubt, let free extension be made, such as may undo the state of impaction, and then, if fracture exist, its ordinary signs will be evinced. In treatment, it is necessary to be very careful to effect accurate coaptation by reduction; then to apply the long splints on the dorsal and palmar aspects, securing the wrist and hand against every motion. The forearm is placed in the state of easy flexion.

Lately, it has been proposed to treat this fracture without splints. The hand "having been brought into a position of strong flexion, the forearm is placed, pronated, on an oblique plane, with the carpus highest, the hand being permitted to hang freely down the perpendicular end of the plane."[1]

[It may be well to remind our readers that two fractures of this part of the radius have been pointed out: Colles's Fracture, described by Mr. Colles, in the *Edin. Med. and Surg. Journal*, 1814; and Barton's Fracture, described by Dr. J. R. Barton, of this city, in the *Philad. Med. Examiner*, vol. i. 1838. In the former, the fracture is usually transverse, and its most common seat is from three-fourths of an inch to one inch above the radio-carpal articulation (*Smith on Fractures, &c.*, Dublin, 1850). In Barton's injury, a fragment is broken off from the margin of the articular surface of the radius, the fracture extending through the cartilaginous face of the bone and into the joint (*Med. Examiner*, loc. cit.).

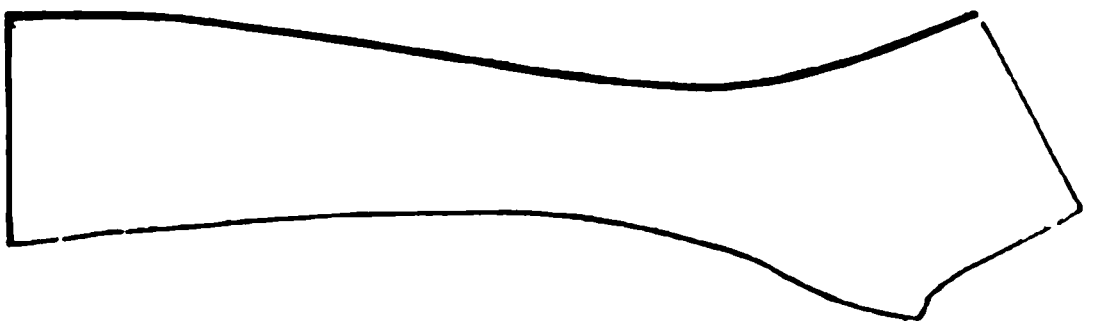
The character of the deformity produced is the same in both cases, and the treatment is identical; but the prognosis, as to complete restoration of the motions of the radio-carpal joint is probably less favorable in Barton's than in Colles's Fracture, because inflammation of the joint is likely to be more severe in the former than in the latter.

This incomplete recovery is an important matter for consideration in the history of this fracture. It is not commonly observed in young, or even middle-aged persons, if due attention is paid to the timeous and faithful performance of passive motion during the whole period of the treatment. But in elderly persons, and especially in such as suffer from chronic or subacute rheumatism, it is not at all unusual to find, at the end of the treatment, that the patient has little or no control over the wrist and finger-joints, and that this condition is permanent, with but

[1] Lancet, 1236, p. 487.

comparatively slight improvement; and this, notwithstanding the utmost care on the part of the surgeon in preventing inflammation, making passive motion from an early period, &c. In order to counteract this difficulty, Dr. Bond, of this city, has recently contrived a splint which allows the patient to bend the fingers and wrist pretty freely, while at the same time the fragments are kept securely in apposition and at rest, and the whole arm in a comfortable position. The splint is made of light wood, cut to the shape of the forearm, and extends from the elbow to the second joint of the fingers. To its palmar extremity is to be firmly attached,

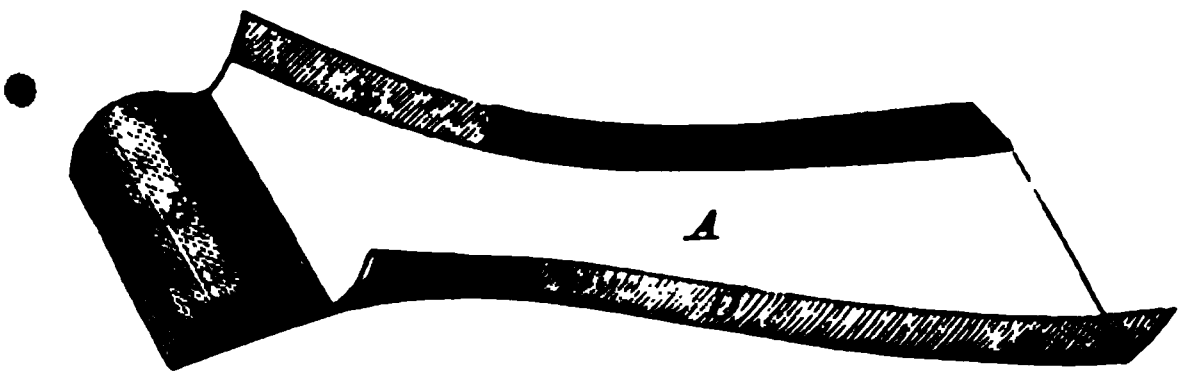
[Fig. 145.]



Bond's Splint—the part for the forearm.

by screws or nails, a carved and rounded block of wood of the size of the patient's hand, which the latter will grasp when the arm is extended on the splint. The splint may or may not be, according to fancy or convenience, covered with binders'-board, the edges of which shall project beyond the sides of the splint, and be turned up, so as to form a kind of box for the arm. If the binders'-board be not used, the splint

[Fig. 146.]



The same, with the carved block *B*, for the hand attached, and the binders'-board, *A D*, applied to the Splint and turned up at the edges.

is wrapped, as usual, in a roller or in muslin, the arm is placed upon it, the fingers are allowed to rest comfortably, or to be moved at pleasure upon the carved block; a compress is to be placed under the arm at the point of fracture, just large enough to fill up any vacuity which the shape of the part may occasion after the fracture is reduced; another compress is to be laid on the dorsal face of the limb, opposite the first, and the arm is lightly secured to the splint by a roller.[1] This splint is now constantly employed at the Pennsylvania Hospital, and by many surgeons in private practice, in this city, and meets with uniform approval.

In the *Am. Journal*, Jan. 1853, Dr. Hays recommends a simplifica-

[1] See the long and very interesting paper of Dr. Bond, in the American Journal, April, 1852.

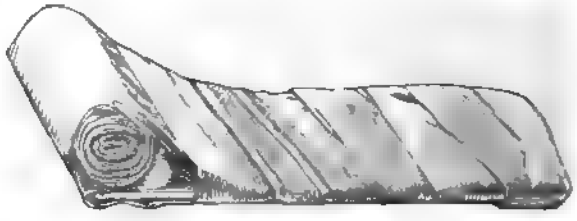
tion of Dr. Bond's splint, which he has found satisfactory in practice. The splint, which was made *extempore*, was formed from the lid of a cigar-box (than which we may say, *en passant*, there is no better material!) by being carved somewhat to the shape of the forearm, extending from the elbow to the distal end of the metacarpus; after having

[Fig. 147.]

Hayt's Splint-Board.

been well padded with cotton, a few turns of a roller were passed around it to secure the padding; the body of the roller was then attached to the face of the palmar end of the splint, corresponding to the carved

[Fig. 148.]



The same, ready for use.

block of Dr. Bond's, and the apparatus was ready for use. The arm was laid upon the splint, as usual, an anterior and a posterior compress were properly arranged, and the whole was secured by a roller.—Ed.]

Fracture of both Radius and Ulna.

This is ordinarily the result of direct violence; and the fractures consequently are at corresponding points—usually near the middle of the forearm. By the action of the pronator quadratus the hand is pronated, and the lower fragments are approximated to each other; they are also drawn upward by the combined action of the extensor and flexor muscles in the forearm, and usually project on the dorsal aspect of the limb. On extension and rotation, crepitus may be very plainly perceived. The treatment is, as for single fracture, by long splints and interosseous pads.

In young persons, both bones not unfrequently give way *at their epiphyses;* an accident which closely simulates luxation of the carpus. Like fracture of the radius alone, it is usually the result of indirect violence, by a fall on the hand. The lower fragments, with the carpus, are displaced backwards; the upper project on the palmar aspect. The

latter are kept in close approximation by the pronator quadratus, while the forearm is pronated by the pronator radii teres. Considerable power is required, by extension, to undo the locking and displacement; and then crepitus is emitted on rotation. The hand usually remains in the middle state between pronation and supination. In treatment, coaptation, by efficient extension, having been accomplished, is maintained by long splints, as in the other fractures.

[*Partial Fracture.*—It happens occasionally that one or both of the bones of the forearm may be only partially broken, *i. e.*, some of the fibres of the bone are ruptured, while others are merely bent. The result is a bending of the bones; no crepitus can be felt; the restoration of the proper shape of the bone is more difficult than in ordinary cases of complete fracture, but when this has been accomplished the deformity is less apt to recur. The treatment is the same as for the ordinary fracture.—Ed.]

[Fig. 149.]

[Partial fracture with bending of the Radius—the patient being young, as indicated by the epiphysis having separated. (From Fergusson.)—Ed.]

Fracture of the Metacarpal Bones.

The *Carpal* bones are seldom fractured but by great and direct force; and then the fracture is not only compound, but also generally accompanied with such injury to other parts as to call for amputation. The *Metacarpal* bones, however, not unfrequently give way—simply, and remediably—by force either direct or indirect; most frequently the latter, as in violent blows delivered on the knuckles. The fragments may be made to ride, by the force which occasioned solution of continuity; and lateral displacement may be subsequently caused by action of the interosseous muscles. The swelling, pain, and powerlessness of the limb, with characteristic crepitus on manipulation, are sufficiently indicative of the nature of the injury. Coaptation is effected by extension, and is secured afterwards by splints, extending from above the wrist to beyond the tips of the fingers, on either aspect. Interosseous pads may be arranged on each side of the fractured bone, on the dorsal aspect; on the palmar, one large and suitable pad is placed, to occupy and maintain the hollow of the natural arch of the hand.

In compound injuries of this part, amputation is to be had recourse to with reluctance. When it is inevitable, let it be as partial and limited as possible, for the obvious reasons formerly stated when treating of amputation on account of disease.

Fracture of the Phalanges.

Fractures of the phalanges are usually compound. But, whether compound or simple, their marks are so plain as to render mistake, under any circumstances, impossible. When preservation of the injured part is deemed practicable and expedient, reduction is carefully effected;

and coaptation is maintained by slender splints of wood placed on the dorsal and palmar aspects.

DISLOCATIONS.

Dislocation of the Clavicle.

1. *The sternal extremity* may be displaced either backwards or forwards. *a. Forwards.*—Dislocation forwards is by much the more frequent; produced by force applied indirectly through the shoulder. The dislodged extremity is seen and felt plainly resting in front of the sternum. Replacement is effected by raising the shoulder, and by carrying it backwards so as to approximate the scapulæ. Treatment is the same as for fracture of the bone, excepting the pad in the axilla, which is here unnecessary. *b. Backwards.*—Dislocation backwards is extremely rare. It has resulted from direct violence applied to the part, and also from the gradual displacement which attends on rotation and curvature of the spinal column. To effect reduction, let an assistant grasp both shoulders, and, placing his knee between, suddenly bend them backwards towards each other, while the surgeon in front pulls forward the end of the bone. For retention, it is necessary to remove the shoulder from the side; and this may be done by placing a large pad in the axilla, and binding down the lower end of the humerus. In an example dependent on spinal curvature, it was found impossible to retain the end of the bone in its proper place; and the distress occasioned by its backward pressure, proved so great as to lead to extirpation of the offending part.[1]

2. *The scapular extremity* is not unfrequently displaced upwards on the acromion, by falls on the shoulder; the amount of deformity and inconvenience being proportioned to the degree of laceration of the confining ligaments. The shoulder is depressed, and the end of the clavicle is seen and felt rising over the spine of the scapula. Reduction is effected by elevation and retraction of the shoulder; consequently, the same treatment is necessary as for fractured clavicle, but maintained with unusual accuracy, as well as for an unusual length of time, the bone being very liable to redisplacement, and consolidation of the ligamentous apparatus being apt to prove both tardy and imperfect.

Displacement of the Angle of the Scapula.

Young men, who use the arms violently in their habitual occupations, are liable to this accident. The latissimus dorsi passes beneath, instead of over the lower angle of the scapula, causing unseemly projection of this, with pain and loss of function in the limb. Reduction is easily effected by direct manipulation, while the arm is much raised and brought backwards, so as to relax the muscle; and, by bandaging and rest, the normal relation may be maintained. On resuming the use of the arm,

[1] A. Cooper on Dislocations, last edition, p. 354.

redisplacement is very apt to occur; a circumstance of the less moment, however, as in time both power and extent of motion are almost completely regained, independently of reduction.

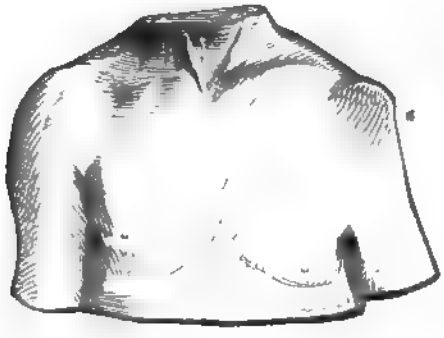
A more serious deformity is connected with paralysis of the rhomboid muscles, and occurs in young persons who follow constrained and sedentary avocations. Displacement of the lower angle not only takes place; but, besides, the base of the bone projects forwards, on moving the shoulder, to such an extent as almost to admit of the hand being placed between the subscapularis and the ribs. In this case, treatment must be mainly constitutional; but the attention is also directed towards restoration of tone in the faulty muscles, by galvanism, friction, and other means.

Dislocation of the Humerus at the Shoulder.

This is more likely to follow indirect than direct violence, as formerly explained (*Principles*, 3d Am. Ed. p. 675). There are varieties; three complete luxations, and two partial displacements.

1. *Dislocation downwards, into the axilla*, is the most common—indeed, is regarded as the ordinary form of injury. In addition to the general signs of dislocation, there are the following: The shoulder is flattened, the deltoid having sunk inwards; an ample and evident space exists beneath the acromion, which process is unusually and strikingly prominent; the arm is slightly elongated, the elbow is abducted from the side; on elevating the limb, the head of the bone is plainly felt in

Fig. 150.



Dislocation of the Shoulder. The flattening shown at *a*. The right shoulder is normal.

the axilla—and it is found to move with the shaft in rotation; motion is greatly abridged, unless when the muscular system is unusually relaxed and flabby; there is no true crepitus; pressure of the bone's head on nerves and veins in the axilla is evinced, by tingling sensations and swelling of the limb; paralysis may follow; not unfrequently the circumflex nerve has been torn across, and permanent paralysis of the deltoid has resulted.

Reduction may be effected, in a variety of ways; pulleys being used or not, according to circumstances (*Principles*, 3d Am. Ed. p. 680, &c.).

In all cases of difficulty, chloroform is of course employed (*Principles*, 3d Am. Ed. p. 735). *a. By rectangular extension*—the axis of extension being intended to relax the deltoid, supra-spinatus, and infra-spinatus muscles, which, according to Sir A. Cooper, are the principal opponents of reduction. And it is well to relax the biceps, also, by flexion of the forearm; the laque being attached, when required, above the elbow. The patient may be either seated or recumbent; and counter-extension is made by a broad sheet or belt passed round the chest—pressure being at the same time made on the top of the shoulder, so as to fix the scapula more completely. After extension has been duly sustained (*Principles*, 3d Am. Ed. p. 681), it is suddenly slacked, and a jerking, coaptating movement is made on the head of the bone upwards; the humerus being used as a lever. When the patient is seated on a chair, much power in this way is obtained by the knee placed in the axilla, on which the humerus is, as it were, suddenly and forcibly bent. Reduction may take place suddenly and with a snap; or gradually, and without a noise. Then the arm is secured to the side, by bandaging, and retained so for a few days.

b. By extension parallel to the axis of the body.—Thus we may succeed, single-handed, in recent or otherwise favorable cases. The patient is laid recumbent; and the surgeon places himself, sitting, by his side. Taking hold of the hand or wrist of the injured limb, the surgeon makes extension by pulling towards him; while, placing his unbooted heel in the axilla, on the head of the bone, and pushing from him, counter-extension is made, and at the same time direct reductive force is applied. Or, instead of pulling by the wrist, a laque may be fastened above the elbow; by a strap or towel attached to which, and passed behind the surgeon's back, extension may be made; leaving the hands free to rotate the flexed forearm. Care must be taken, however, that the heel's force is neither excessive, nor unduly directed; for it has happened that, failing to reduce a dislocated humerus, the operator has caused fracture of the ribs. Rupture of the axillary artery, also, with subsequent formation of false aneurism, has been caused by the heel—booted, and used rashly. Failing with the heel, the strap for producing counter-extension is placed in the axilla, and extension made steadily with pulleys, with such rotation and manipulation as seem necessary (*Principles*, 3d Am. Ed. p. 681).

c. By movement upwards.—This is the method of Malgaigne. The shoulder and chest are steadied, while the arm is forcibly raised above the head; and, if need be, extension is made in that direction, with subsequent manipulation directed against the head of the bone. It is expected, however, that these latter proceedings may not be required, the bone slipping into its place during the upward movement.

Such details as to reduction apply mainly to those cases in which, from some cause or other, anæsthesia is not employed. With the full effect of chloroform the muscular frame is so relaxed, that in general little else than simple extension, with coaptation, is required; it being comparatively immaterial in what direction the extension is made.

2. *Dislocation forwards, beneath the pectoral muscle.*—The head of the bone is displaced to the inside of the coracoid process, and is locked

between that and the clavicle. There is the same flattening of the shoulder, with abnormal subacromial space, as in the preceding accident; but to a greater extent. There is less pain, the axillary plexus being free. Motion is more abridged. The elbow is abducted and thrown back. The head of the bone may be both seen and felt in its abnormal site. The arm is somewhat shortened. *In reduction*, the extending force is to be made downwards and backwards, in a line with the body, not in a rectangular direction; in order to avoid the resistance of the coracoid process.

3. *Backwards on the dorsum of the scapula.*—This is the rarest form of complete luxation. Palpable presence of the head of the bone, in its new locality, is sufficiently diagnostic. Reduction may be effected very simply, by merely elevating the arm, and carrying the hand behind the head. Failing this, the ordinary means are to be employed, as for dislocation downwards.

4. *Subluxation on the coracoid process.*—A partial displacement may take place in this direction. There is slight flattening of the shoulder, with a corresponding degree of vacancy beneath the acromion, and the head of the bone is felt and seen projecting on the coracoid process. Reduction is beset with no difficulty; in fact, the manipulation required for diagnosis generally succeeds in effecting replacement. The accident is rare.

5. *Subluxation upwards, with displacement of the long head of the biceps.*—The long tendon of this muscle may be displaced from the bicipital groove, and laid over the lesser tubercle. In consequence, the head of the humerus escapes upwards, coming into immediate contact with the acromion. The accident is obscure, and probably rare. It is noted by loss of power in the biceps, by pain in the seat of injury, and by the peculiar deformity attendant on the upward displacement of the head of the bone. Reduction is effected by a coaptating manipulation, directed to the tendon, during flexion of the forearm.

Dislocation of the Radius and Ulna at the Elbow.

1. *Backwards.*—Both bones of the forearm are not unfrequently displaced backwards, without fracture of any part, by falls on the hand,

Fig. 151.

Dislocation of both Bones backwards.

with the elbow in a state of semiflexion. The joint is much deformed, and has its motion greatly abridged. The hand and forearm are supine;

the joint is bent nearly at a right angle, and can be neither completely flexed nor extended. The ulna and radius form a very marked projection posteriorly, and, on examination, the olecranon is found on a higher level than the external condyle of the humerus. The coronoid process of the ulna rests in the cavity which ought to receive the olecranon; and on each side of the olecranon a hollow is caused, by absence of the lower part of the triceps from its wonted locality. The trochlea of the humerus, projecting forwards, forms a hard swelling behind the tendon of the biceps.

Reduction may be effected in two ways. *a. By extension, with coaptation, from behind.* This is the preferable mode. The patient is placed with his back to the surgeon, and the chest having been fixed, extension is made with the arm directed completely backwards, in a rectangular relation to the trunk, so as to relax the triceps muscle. Very frequently, in recent cases, the operator thus succeeds, single-handed, by extension alone. With the left hand he makes counter-extension on the scapula, while with the right he extends from the wrist. In difficult cases, extension is intrusted to assistants, with or without pulleys, while the surgeon conducts the direct coaptating manipulations of the joint, the patient under chloroform. *b. By forcibly bending the joint over the knee.*—The patient having been seated on a chair, the surgeon places his knee in the hollow of the elbow. Pressing the radius and ulna down upon the knee, the coronoid process is freed from the humerus, by separation; and then, on forcible yet gradual flexion, reduction is effected.

Fig. 152.

Dislocation of the Elbow; showing preternatural fulness in front.

2. *Laterally.*—Both bones may be displaced laterally, as well as backwards, in two ways; to the inside, or to the outside. *a. Backwards and outwards.*—The coronoid process rests on the back part of the external condyle. The ulna projects more backwards than in the ordinary dislocation. The radius forms a protuberance behind and on the outer side of the elbow, where its head may be felt plainly rotating. The inner condyle projects palpably. *b. Backwards and inwards.*—The external condyle projects. The ulna is prominent posteriorly, resting on the inner condyle, while the head of the radius is placed in the posterior fossa of the humerus. *Reduction*, in either case, may be effected as in ordinary dislocation.

Dislocation of the Ulna at the Elbow.

The ulna may be displaced, singly, in two directions. 1. *Backwards.*—The olecranon projects behind. The forearm is much twisted inwards, with pronation of the hand. The elbow is bent nearly at right angles, flexion can be but very slightly increased, and extension is quite impracticable. *Reduction* is effected by bending the elbow

over the knee, and drawing the forearm downwards. The radius proves of use, in this movement, by pushing the external condyle back upon the ulna.

2. *Backwards and inwards.*—The olecranon projects much behind, the coronoid process rests on the inner condyle, and a finger may be placed in the sigmoid cavity. The forearm is semiflexed, the hand pronated. Extension may be performed readily by the surgeon, but complete flexion is impracticable. Much pain is experienced, on account of pressure on the ulnar nerve. *Reduction* is effected by direct efforts of coaptation, during powerful and sustained extension. The accident is rare.

Dislocation of the Radius at the Elbow.

The radius may be displaced singly, also, in two directions. 1. *Forwards.*—The head of the bone rests in the hollow above the external condyle, and may be felt there. The forearm is slightly bent, and can be neither completely flexed nor extended. On attempting flexion, the head of the radius is felt to strike against the humerus, abruptly arresting the movement. The hand is inclined to pronation. *Reduction* is effected by grasping the hand firmly, performing supination, and extending the forearm steadily.

Fig. 153.

Dislocation of the Radius forwards.

2. *Backwards.*—The head of the radius is displaced behind the external condyle and to its outside; and in this locality it can be both seen and felt very plainly, especially on extending the limb. *Reduction* is managed as in the preceding accident, but with the hand pronated, not supine.

[*Compound Dislocation of the Elbow.*

Compound dislocation of the elbow may occur, complicated, perhaps, with fracture of the upper part of the ulna or radius, or of the condyloid

[Fig. 154.]

Compound Fracture of Elbow. (From Fergusson.)

portion of the humerus. In this form of injury, if the soft parts are not too seriously damaged, and the bone not too much comminuted, and if the main artery has escaped, reduction may be attempted. If this cannot be accomplished, the propriety of *resection* of the bone or bones should be considered before amputation of the arm is determined on, as in the case of compound fracture of the elbow.

In case of reduction, the wound in the soft parts should be closed as accurately as possible; lint, saturated with some adhesive material, should be placed upon it, and every effort made to procure union by the first intention. During the treatment, the arm should be maintained partially flexed, upon a properly constructed splint.—Ed.]

Dislocation of the Wrist.

1. *Dislocation of the Radius and Ulna.*—These bones may be displaced, together, either on the dorsal or on the palmar aspect of the

[Fig. 155.]

[The Anterior Dislocation of the Radius and Ulna at the Wrist. (From Ferguson.)—Ed.]

wrist. Falling on the palm, the two bones may be displaced forwards on the annular ligament; while, from a fall on the back of the hand, the reverse movement is likely to occur. In either case, the signs are plain; a dorsal and a palmar swelling exist, composed either of the carpal bones or of the ends of the radius and ulna, as the case may be; and, by rotation and manipulation, it is ascertained that continuity in the radius and ulna is unbroken. The accident is rare; fracture of the radius being a much more common result of the same exciting cause. *Reduction* is readily effected by extension

[Fig. 156.]

[The Posterior Dislocation of the Radius and Ulna at the Wrist. (From Ferguson.)—Ed.]

and coaptation. And it is well to maintain retention for some time, by splints, as for fracture of the bones.

Subluxation forwards is by no means an uncommon result of falls on the palm; the bones being not only displaced towards the palm, but also separated from each other. The nature of the accident is plain, and reduction is easy. But, unless splints be carefully worn for at least a fortnight, deformity by continuance of partial displacement may scarcely be averted.

2. *Dislocation of the Radius at the Wrist.*—The distal extremity of the radius may be displaced *forwards*, separately; resting on the scaphoid bone and trapezium. The styloid process is no longer situated opposite to the latter bone; and the end of the radius may be both felt and seen projecting on the forepart of the wrist. The hand is twisted. *Reduction* is effected by simple extension and coaptation. Splints are necessary for subsequent retention.

3. *Dislocation of the Ulna.*—Dislocation of the ulna, separately, may take place *backwards;* the end of the bone projecting plainly, with twisting of the hand; and the line of the styloid process showing obvious alteration. Reduction and retention are managed as in the preceding accident.

4. *Dislocation of the Carpus.*—Complete luxation of any of the carpal bones is rare. But subluxation of the os magnum and of the cuneiform bone is occasionally met with; weakening the joint, and causing projection on the back of the wrist during flexion. Treatment is by continued pressure and support from without, and by disuse of the part for some considerable time.

Dislocation of the Fingers.

By falls sustained on the tips of the fingers, dislocation of the phalanges is sometimes produced; and the displacement is usually on the dorsal aspect. It is more common between the first and second phalanges, than between the second and third. The nature of the injury is exceedingly plain; and replacement is effected by extension and coaptation. To render extension effective, it may be necessary to affix a laque, a piece of tape, or the end of a silk handkerchief, or a ribbon, to the distal phalanx, by means of the clove-hitch (*Principles*, 3d Am. Ed. p. 680). Sometimes the handle of a key may be used advantageously as an instrument of reduction. Splints are expedient for some days afterwards.

Compound dislocations almost always are of such severity as to demand amputation.

Dislocation of the Thumb.

The first phalanx is not unfrequently dislocated backwards on the dorsum of the metacarpal bone; and is reduced, in general, with difficulty, on account of the strong lateral ligaments which oppose the retrograde movement; and also on account of the many strong muscles—

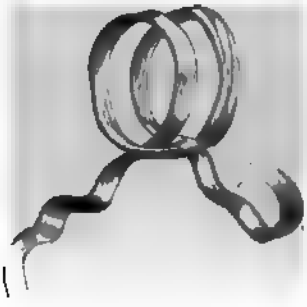
eight—which are connected with this part, and require to be overcome in the extension. Extension having been maintained for some time,

[Fig. 157.]

[Dislocation of the first phalanx of the Thumb, backwards, on the dorsum of the Metacarpus. (From Fergusson.)—Ed.]

steadily, by means of a suitable laque attached to the first phalanx, flexion is made towards the palm; and during this forced movement, slowly yet determinedly performed, reduction is usually accomplished.

[Fig. 158.]



[Noose, or laque, for the purpose of making extension upon the Bone. (From Fergusson.)—Ed.]

It may be necessary, in extreme cases, to have recourse to subcutaneous section of one or other lateral ligament; but such necessity, with the use of chloroform, may scarcely be expected to arise.

Hind, on Fractures, London, 1836. Lonsdale, on Fractures, London, 1838. A. Cooper, on Dislocations and Fractures, London, 1842. Dupuytren, on Diseases and Injuries of Bones, Sydenham Society, London, 1847. Smith, on Fractures in the Vicinity of Joints, &c., Dublin, 1847. Vincent, Observations on Surgical Practice, &c. London, 1847. [Callaway, Fractures in the Vicinity of the Shoulder-Joint, London, 1850. Malgaigne, Traité des Fractures, Paris, 1850.—Ed.]

CHAPTER

INJURIES AND DISEASES OF THE SPINE.

Concussion of the Spinal Cord.

By falls or blows, the spinal cord, like the brain, may sustain a greater or less degree of concussion; having its functions arrested or disordered, without actual lesion done to its structure. The concussion may be either general or partial. In the latter case, it is probable that the whole cord suffers, though unequally; the major effect being at and beneath the part struck—as denoted by paralysis, more or less complete, of the parts thence supplied by nerves. This paralysis is transient; passing off in a few hours—or days; never of long duration when simple—that is, when not accompanied or followed by extravasation or effusion. As in the case of the brain, reaction may prove excessive, and inflammatory action may speedily supervene; attacking the cord, its membranes, or both, and ushering in a completely new train of symptoms. Or—also as in the case of the brain—the immediate results of the injury may all seem happily to pass away; and, at a remote period, an insidious chronic inflammatory process may occur, in the cord or in its membranes; causing, in the one case, thickening with effusion, in the other, purulent softening of slow progress.

Treatment is guided by the same principles as in concussion of the brain (p. 38). Absolute quietude is enjoined; and the period of reaction is carefully watched. If it threaten to prove excessive, antiphlogistic measures are adopted, according as circumstances may seem to demand. And, for a long period after receipt of the injury, the patient must be content to use all the precautions of a prudent invalid, so as to avert, if possible, the insidious and formidable remote results. These, having threatened, are best met by rest and patient counter-irritation—with appropriate constitutional treatment.

Softening of the spinal cord, chronic, insidious, and intractable, is no unfrequent consequence of severe falls, or blows, upon the spine; more especially in those in the better ranks of life, who have lived hard, and indulged much in venery. The lower limbs first begin to fail, the extensor muscles proving unequal to maintain the erect posture, and the knees consequently ever and anon threatening to give way. The feet are moved oddly, and are not planted on the ground firmly, or with certainty on the spot intended; the legs are thrown outwards in stepping, and bring the feet down with a slap. The body is stooped in walking; and the line of progress is seldom a straight one. The

eight—yet sluggish, and the abdomen enlarges. The urine is voided in the difficulty. The arms are found to be weak; and the fingers seem gradually freeing themselves from control of the will; there being the same uncertainty and inefficiency in doing anything with the hands and fingers, as was first observed in the lower extremities. Not unfrequently, the patient is much harassed by neuralgic pains, shooting down the back and limbs, and sometimes affecting the head also. Gradually, such symptoms increase; urine and feces come to be passed involuntarily, or almost so; the use of the limbs becomes more and more feeble and uncertain; the brain at last is involved; the mind grows imbecile, as well as the body; and the patient dies, often with symptoms of slow compression. The spinal cord is often found more or less affected with *ramollissement;* sometimes, however, it presents no organic lesion. But little benefit can be expected from treatment. Of heroic remedies, there is no tolerance. Indeed, the prudent practitioner contents himself with enjoining great temperance in all things; while, by the employment of ordinary and simple means, he seeks to palliate symptoms, and delay the fatal issue.

Compression of the Spinal Cord.

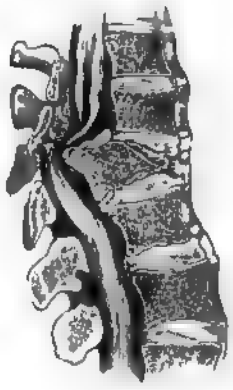
This may be caused, as in the brain, by extravasation of blood, on the surface or in the substance of the cord; by fracture and displacement of the vertebræ, producing direct pressure on the cord, with or without laceration of its substance; by inflammatory exudations and effusions exterior to the cord; or by purulent disorganization of the cord itself, the result of inflammatory action. Very obviously, the direct interference of operative surgery is here of no avail; the trephine is not to be thought of. Treatment consists of expectant rest, in the first instance; anxiously looking for the earliest appearance of inflammatory action; opposing this by the suitable means, yet not heroically—knowing that in such cases active and extreme depletion is ill borne; and mitigating the symptoms connected with the paralytic state, as far as the resources of our art will allow. In the case of extravasated blood, if the immediate risk be overpassed, we may reasonably entertain expectation of a fortunate result. On the other hand, few cases of displaced fracture are wholly recovered from. And the end of inflammatory disorganization, whether chronic or acute, is almost invariably disastrous.

Fracture of the Spine.

Severe and direct violence is more likely to cause fracture than dislocation of the vertebræ; these bones being so intimately connected to each other by their articulating processes. The spinous processes alone may be broken. There is then little displacement; and the consequences are but trivial. But fracture traversing the body of the bone, making a complete solution of continuity in the spinal column at that part, is fraught with the utmost danger. Structural injury has probably been inflicted, at the same time, on the spinal cord and its mem-

branes; extravasation of blood has taken place into the canal; probably this is displacement of the fragments, and farther injury thereby done to the soft parts within. Ordinarily, therefore, the most prominent sign of spinal fracture—besides pain, swelling, mobility, crepitus, and departure from normal outline at the injured part—is paralysis of those muscles whose nervous supply proceeds from beneath the seat of injury.

Fig. 159.



Fractured Spine, bisected; showing the formidable and fatal injury inflicted on the cord.

According to the seat of injury, the nature of the case materially varies. When the *lumbar* region has suffered, the more prominent symptoms are—paralysis of the lower limbs, usually with loss of sensation; involuntary discharge of feces; retention of urine; and, frequently, priapism. When the injury has occurred in the *upper dorsal*, or *lower cervical region*, in addition to these symptoms there are—paralysis of one or both arms, difficulty of breathing, sluggishness of the bowels, with distension of the abdomen. If, again, the fracture be *above the origin of the phrenic nerve*—and compression there prove great—respiration will at once cease, causing death.

An almost invariable result of spinal fracture, wherever situated, is a deteriorated condition of the urinary organs. The kidneys err in their function; and the lining membrane of the bladder, becoming the seat of chronic congestion, assumes a most depraved action; copious, fetid, turbid, ammoniacal urine passes away, with sad aggravation of the general disorder of system. The bowels, too, are not merely distended and sluggish, but become depraved in the function of their mucous membrane; the dejections evincing a very vitiated character. Bed-sores are apt to form.

The symptoms, continuing and gravescent, may terminate in death, or, gradually mitigating, recovery may ensue, more or less complete. Obviously, the dangers to life are both many and formidable; inflammatory action in the cord or membranes, effusion, exudation, disorganization, secondary affections of the digestive and urinary organs, bed-sores, and general exhaustion. It need not excite surprise to find the average of recoveries extremely small.

The *treatment* may be reduced to simple principles: Very careful movement of the patient, and adjustment on a hard mattress, lest farther displacement of the fragments occur. [The best bed for patients suffering with fracture of the spine, is the water-bed of Dr. Arnott. But this is accessible to but few; in hospitals, it should be provided for all such cases. The ordinary mattress may, perhaps, hasten the sloughing which always attends this injury, and the feather-bed has nothing to recommend it.—Ed.] An equally careful reduction of the displacement which is found to exist. Retention, by adaptation of a splint, of wood, pasteboard, gutta-percha, or padded iron, on each side of the spine, for some distance above and below the site of injury.

Enforcement of absolute quietude, antiphlogistic regimen, and the other obvious prophylactic measures. Moderate antiphlogistics, should symptoms of overaction exhibit themselves. Mitigation of the unpleasant results occurring in the digestive and urinary organs; obtaining regular and better movements of the bowels; relieving the bladder by the catheter, at stated and frequent intervals; and rectifying the state of the urine, by mineral acids and other medicinal means in ordinary use for that purpose. Ultimately, immediate danger having passed by, directing attention to amendment of circulation in the paralytic parts; thus preventing shrinking by atrophy, and perhaps assisting in the recovery of function. The means usually employed to fulfil the last indication, are friction, shampooing, galvanism, and electricity, and the use of strychnia. Galvanism and electricity are to be used with caution, however; it being the opinion of some, that although, by means of these agents, muscular contractility may for a time be roused, yet that the amendment is in general but temporary, and that the parts ultimately lapse into a worse degree of impotency. Counter-irritation is sometimes of service.

In the obviously displaced spinal fracture, with symptoms of compression of the cord, it has been proposed to employ the trephine, with the view of relieving the injured medullary matter. Reason and experience, however, have decided against the procedure, inquiry having shown that the compressing agent is usually the fore part of the body of the vertebra, which cannot be reached and dealt with from without.

Spinal fissure may occur, without displacement, and yet may prove fatal, from another cause than concussion. Into the cleft, a portion of the membranes may be received and retained; the constriction acts as an uninterrupted exciting cause of inflammatory action, and fatal exudation or structural change ensue. The case is obscure in its course, and is likely to be unfortunate in its issue, all remedial means proving of little avail to arrest an action, which is being ever fed and maintained by an influence which is inaccessible and consequently insuperable.

Dislocation of the Spine.

Luxation of the spine, without fracture of the processes, is a rare injury; yet has occurred, occasionally, in the cervical region, ordinarily between the fifth and sixth vertebræ. It has happened by muscular power alone; a maniac, for example, having so caused death by, as it were, forcibly throwing his head from him, during restraint in a paroxysm of excitement. More frequently it is the result of violence applied from without, as by falls on the head. Suspension sometimes causes it, but much more rarely than is generally supposed; usually, there is no displacement of the vertebræ whatever, even in criminal cases, death taking place from other causes (*Principles*, 3d Am. Ed. p. 693).

The displacement is easily recognizable on manipulation, and the concomitant symptoms of compressed or torn spinal cord are sufficiently explicit. If life, or the hope of life, remain, replacement is to be effected by careful extension and coaptation; afterwards, untoward results are

Fig. 160.

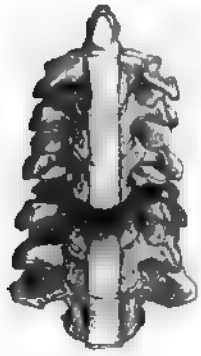


Fig. 160. Dislocation of the Spine, between the fourth and fifth cervical vertebræ. The patient fell backwards over a high paling, and alighted on his head. Cord torn. Complete paralysis. In one fatal, within a few days.

Fig. 161.

Fig. 161. The same; seen laterally.

to be obviated by such management as has been advised in the case of fracture.

Subluxation, or partial displacement of the vertebræ, is by no means uncommon, and may take place at any part of the spinal column. It is probably of most frequent occurrence in the dorsal region, caused by falling on the breech, from a considerable height, with consequent forcible bending of the trunk forwards. The posterior ligamentous apparatus gives way, to a greater or less extent, and a hiatus between the spinous processes results. The symptoms, in addition to the marks of displacement, are those of severe spinal concussion, and the subsequent dangers are also such as may be expected to follow that accident. By extension, replacement is gently effected. The same retentive apparatus is then applied as for fracture, and must be worn patiently for weeks; the patient resuming use of his lower limbs very gradually, and not till after many weeks have elapsed. Throughout the whole period of treatment, an anxious regard is paid to the spinal cord, and remedial measures are adopted, if necessary, to ward off morbid action there.

Lateral Curvature of the Spine.

Lateral curvature of the spine is usually held as contrasted with antero-posterior curvation; the latter the result of ulcerative lesion in the bodies of the vertebræ, the former originally unconnected with structural change. In the one, there is mere change of position; in the other, there is change and loss of bone, by the results of inflammatory action which has originated there. It is right to remember, however, that in some cases the antero-posterior curve is found to be of the same nature as the lateral displacement—originally unconnected with structural change.

Lateral curvation may arise from different causes. And it is important to classify the cases accordingly, that the suitable treatment may

be afforded to each. 1. *Peculiar avocations* are not unfrequently the cause. Those, for example, which entail an habitual use of the right arm, much disproportioned to that of the left; as in blacksmiths and dragoons. The muscles of the right side become largely developed, and powerful; and the trapezius and rhomboids, thus changed, acting on the spinal column so as to overpower their fellows of the opposite side, have the effect of gradually inducing distortion—it may be to a considerable extent. Of course, this is most likely to occur during adolescence. The remedy is simple; partial discontinuance of the use of the right side, with increased employment of the left. The displacement, if recent and slight, can be perfectly removed.

2. *Bad habits*, of standing, sitting, or reclining, in an awkward position, are very apt to cause a greater or less amount of lateral distortion in the young. The spinal column is habitually thrown off its normal line of erection; and, in course of time, both muscles and bones, becoming accustomed to their abnormal position, may refuse to assume any other. And thus curvature, both great and confirmed, may become established, without any actual vice in the skeleton, the muscles, or the general system. Obviously, there is one class of human beings much more than any other exposed to this form of curvature; namely, young girls occupied in the crowded details of an imprudently managed course of education. Young people of both sexes are also very liable, who are employed in sedentary occupations in trade; as in sewing, knitting, engraving, coloring, &c. The indications of treatment are plain; discontinuance of the hurtful habit or occupation; ample amount of exercise out of doors; and a voluntary use of such gymnastic or other exercises as are calculated to produce a healthful play of the general muscular system, and more especially of the muscles of the trunk and spine.[1] And by means of light articles of dress, fashioned and worn so as to attract the patient's notice to the threatened deformity, while at the same time they warn of the negligence or awkwardness which has led to it, disuse of the habits in question may be greatly favored. By some, the influence of a pulley and weight, horizontally extended on the opposite side, is made to act correctively on the curve.[2] But all cumbrous apparatus—in the shape of stays, or other machinery—are plainly to be avoided, as likely to prove most hurtful.

3. Hitherto, we have spoken of simple deformity. Now, we have to do with disease. *General Debility*, however induced, in the young, is a frequent cause of lateral curvature; insufficient food and clothing, excess of confinement and work, febrile or other affections leaving the system exhausted—are all causes of such debility, with its consequent injurious influence on the spine; and to these all ranks of life are subject. The muscular system grows especially weak; the extensors of the trunk are unequal to the task of duly maintaining the erect posture: and deviation from the straight line results—at first occasional, afterwards habitual, and ultimately confirmed. In the previous examples of lateral curvature—unconnected with actual disease—the curvation begins

[1] Sir B. Brodie, Lancet, No. 1218, p. 3, *et seq.*
[2] Dr. Brown, of Boston, U. S. Lancet, No. 1329, p. 178.

usually in the dorsal region, and is mainly situated there. But in this case, the beginning of curvation is more likely to take place in the lumbar region—at the basis of the pyramid of support. An inclination is made to either side; then, to atone for that, an opposite curve is made in the dorsal region. And, not unfrequently, there is a third ultimately established in the cervical, in a direction opposed to that of the dorsal. As the amount of bending increases, rotation at the same time generally takes place—the rotation being towards the same side as the curve; the height of the spinal column, too, greatly decreases; and, in consequence, serious changes happen to the thoracic and abdominal viscera. The ribs expand on one side, while they are closed on the other; and they fall inwards, narrowing the chest in its lateral direction, and producing prominence of the sternum and of the costal cartilages. The heart and lungs become incommoded, and labor in their function. The sternum, too—with its costal appendages—has approached unusually near to the pelvis; the abdominal space is narrowed in consequence, and its organs are injuriously affected. At first, the spinal change is chiefly in the intervertebral spaces; and the deformity, at that time, is capable of being undone, by appliances from without, or, partially at least, even by the efforts of the patient. But, by and by, the bones become consolidated in their new relation; interstitial absorption taking place at the compressed points, while corresponding expansion or growth occurs at those which are free; and then the deformity has become fixed and irremediable—a circumstance of very important and obvious bearing on the question of treatment.

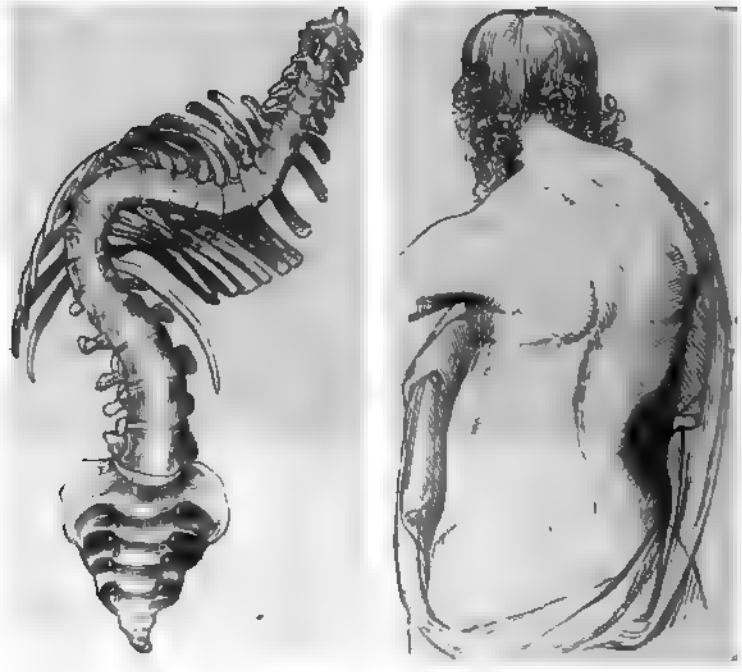
The indications of treatment are directed fully more to the state of the general system than to the part affected. A tonic regimen is patiently persevered in; at the same time, the deficient extensors are to be roused by friction and by suitable exercise; and from time to time, by manipulation, a restoration of the normal outline of the spine is to be attempted. To aid in the fulfilment of the last indication, a light mechanical contrivance may be occasionally employed, restorative yet not oppressive. But all cumbrous or confining apparatus, continuously worn, must prove prejudicial; the muscles, already weak, will be enfeebled more and more; and the original malady cannot fail to sustain aggravation. Good diet and clothing; regulation of the bowels; exposure to good air; judicious use of medicinal tonics; friction of the back, acting more especially on those muscles which seem most deficient; healthful exercise, both of the general body and of the muscles of the trunk, short of fatigue; and occasional attempts at readjustment by mechanical appliances, constitute the most important means towards alleviation and cure. Myotomy has been practised, both in this and in other forms of spinal distortion, but with no good result. The experience and judgment of the profession are alike opposed to it.

4. *A diseased condition of a muscle or bone, in another part*, may cause curvature of the spine. Thus, a rigid and contracted state of the sterno-cleido-mastoid muscle of one side, producing the state called Torticollis, is very apt to cause spinal curvature, as has already been noticed. The remedy is simple; by division of the offending muscle. And, again, shortening of a lower limb, by morbus coxarius, or by ill-

united fracture, unless atoned for by suitable mechanical contrivance, can scarcely fail to cause more or less distortion of the vertebral column.

5. *Rickets* is certainly not the least common cause. And the curvatures, so occasioned, are at once the most rapid and decided in their progress, and the least amenable to treatment. The peculiar characteristic is indication of the rickety state; strumous complexion and character, and distortion of other parts of the skeleton, as well as of the spinal column (*Principles*, 3d Am. Ed. p. 442). The results of extreme spinal curvature, usually with rotation, are rapidly developed; and, at

Fig. 162. Fig. 163.



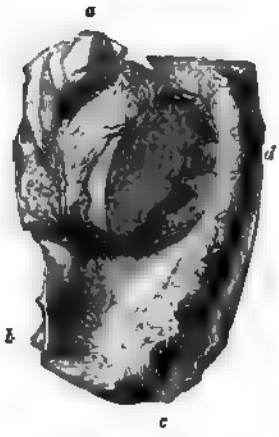
Figs. 162 and 163. Permanent Curvature of the Spine, with rotation, produced by Rickets.

the same time, the pelvis and lower limbs, as well as the clavicles and the superior extremities, are more or less distorted. Usually, the direction of the spinal curvature is lateral; but it may be antero-posterior. The treatment—prophylactic and curative, is such as has been already considered (*Principles*, 3d Am. Ed. p. 446, &c.). It is here that the use of mechanical aids, in the shape of stays and belts, is not only allowable but highly necessary, when the patient is in the erect or semi-erect posture, and especially when exercise is taken; yet requiring much prudence and skill both in their first adjustment and subsequent use.

Disease of the Bodies of the Vertebræ.

Interstitial absorption frequently occurs, in connection with simple curvature, as already stated; whereby a distortion, at first remediable, becomes ultimately confirmed and unalterable. It also occurs as a primary affection, in the bodies of the vertebræ, as a prelude to carious ulceration (*Principles*, 3d Am. Ed. pp. 281 and 410). More rarely, it exists as a separate and distinct disease, causing displacement by curvation forwards at the affected part; and deposit, following on absorption, after a time, confirms the curve by consolidation. Treatment is by rest and gentle counter-irritation.

Fig. 164.



Continuous absorption illustrated by the pressure of an Aortic Aneurism on the Bodies of the Vertebræ. *a*. The arch of the aorta. *b*. The descending aorta. *c*. The vertebral column. Opposite *d*, the bodies of the vertebræ are seen excavated, with corresponding processes of the compressing clot; while the intervertebral substances, successfully resisting the pressure, project into corresponding depressions of the fibrine.

Continuous Absorption, and *Simple Ulceration* occur in the bodies of the vertebræ, as the results of pressure; the former often is caused by the gradual action of an aneurismal tumor; the latter may result from the more speedy operation of the same cause, and is sure to be produced by the pressure of an abscess. Healing takes place, on removal of the cause—if that be in our power.

Caries of the Vertebræ is a most formidable affection, and unfortunately not of rare occurrence. It is the ordinary cause of sharp antero-posterior curvature usually termed "angular;" sometimes attributable in its origin to external injury, but often unconnected with any assignable exciting cause. The morbid action follows the ordinary course (*Principles*, 3d Am. Ed. p. 413); sometimes limited to one or two bones; often involving almost the whole chain. Its most frequent site is in the dorsal region. Usually, it is associated with, and probably dependent on, the strumous diathesis. Obscure spinal symptoms generally precede; pain, uneasiness, numbness, and weakness in the limbs; spasmodic twitchings; obstinate bowels; alkaline urine, with trouble in discharging it. In the part there is dull uneasiness, and ultimately pain, which is increased by pressure, and rendered intense by sharp percussion. The gait is tottering and uncertain; with the back kept peculiarly rigid, so as to avoid motion of the diseased vertebræ. Often a distressing sense of constriction is felt in the chest, as if this were girded by a tight cord. The symptoms of paralysis manifest themselves gradually; affecting different parts, according to the site of the vertebral disease; and usually motion is impaired before sensation—as can readily be understood on reference to the anatomical arrangement of the nerves given off from the spinal cord. Sharp curvature, forwards, advances more and more. The matter, in which the carious mass is bathed, accumulates; and, seeking an out-

let, points at some part of the surface—directly, on the back; or at some distant point, as in the loins or groin. The ultimate result may be cure by anchylosis, in the slighter cases; the curve remaining per-

Fig. 165.

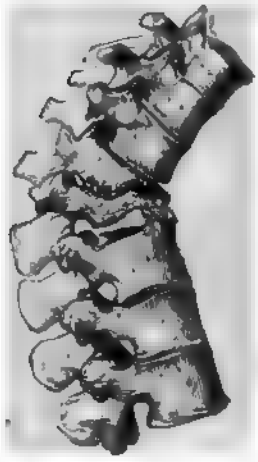


Fig. 166.

Fig. 165. Caries of the Vertebræ; macerated; the bodies extensively destroyed; morbid curvature forwards.
Fig. 166. The same during life. Angulation.

manent. Much more frequently, the issue is fatal; occurring rapidly, by the effects on the spinal cord; or more gradually, by hectic and exhaustion.

Treatment consists in affording absolute rest to the part, by confinement to the recumbent posture; with attention to the general health, and patient continuance of cod-liver oil. In the avowedly strumous cases there is usually an intolerance of all forms of active counter-irritation, which threaten to accelerate the fatal issue by exhaustion; and, in such patients, we are to content ourselves with rest and general management, looking gloomily to the result. And in all cases, caustic issues are only serviceable at the commencement of the disease. The prone position is usually preferable to the supine; as relieving the spinal column more thoroughly from the superimposed weight, and proving favorable to venous return from the bodies of the vertebræ. And "the prone couch," employed almost constantly, day and night, will be found in most cases a great assistance in the treatment; becoming, after a time, not only not irksome but absolutely agreeable to the patient; and of course

Fig. 167.

Caries of the Vertebræ; previously to maceration. The aorta overlays the cyst of the abscess.

so managed as to avoid, as far as possible, even the very appearance of restraint. In all cases, mechanical adjustment of the distorted spine by force is manifestly at variance with both surgery and sense.

Caries of the upper cervical vertebræ requires the most careful management, lest, by sudden motion, displacement should occur, causing fatal compression of the upper part of the cord. The patient seems to be instinctively aware of this hazard; and, on moving his head, always supports the chin carefully on the hand, while the whole body—as a pillar—is made to turn in obedience to the direction of its capital. Here, mechanical contrivance is most suitable and necessary; in order to guard against sudden motion, and at the same time to relieve the diseased bones from the weight of the head (p. 286). By this and counter-irritation, with due attention to the general health, cure by anchylosis is to be sought for. And though in no case our hope need be sanguine, neither in any need it give place to despair; seeing that our museums show cures by anchylosis under circumstances the most unfavorable—the spinal cord having accommodated itself to great displacement, as well as loss of substance, affecting even the atlas and dentata.

Lumbar and Psoas Abscess.

By *Lumbar Abscess* is understood, a collection of matter pointing somewhere in the lumbar region. It may originate wholly in the soft parts. More frequently, it is the result of caries of the vertebræ. Treatment depends on the nature of the case. If there be no prospect of ultimate cure, no opening should be made; the ordinary palliatives are to be administered, and every care is to be taken to keep the integuments entire. If the case present a favorable aspect, on the contrary—the amount of disease in the spine seeming slight, and the system yet tolerably robust—a free evacuation should be made by puncture. By the inflammatory disintegration following on such opening, we are most likely to obtain such spontaneous change in the state of the bone, as will admit of the healing process (*Principles*, 3d Am. Ed. p. 418). But the action requires an anxious watchfulness, lest it involve the system in a dangerous amount of disturbance, and lest, also, by excess, it prove prejudicial to the affected part. If a case present itself, in all local respects promising, but with the system accidentally low, the opening should be delayed until, by time and suitable management, the constitutional powers have been somewhat restored, and a tolerance of the remedy regained.

When the matter connected with vertebral disease points in the groin, having descended along the course of the psoas muscle, the affection is termed *Psoas Abscess;* but it, too, may occasionally be found unconnected with disease of bone. Treatment is the same as in the former instance. Under care, cod-liver oil, and the prone couch, sometimes wonderful recoveries take place; even after long-continued discharge.

Spina Bifida, or Hydrorachitis.

This is a congenital malformation, usually situated in the lumbar region; but it may be in the dorsal or sacral. The posterior part of one or more vertebræ is deficient; and, in consequence, the membranes of the cord protrude, constituting a tumor of greater or less size—composed of the ordinary integuments, the changed spinal membranes, and the spinal fluid secreted in excess. In other respects, the child may be fully and well formed. More frequently, it is otherwise defective; the lower limbs, especially, being shrunk and paralytic. Usually, the tumor enlarges, by accumulation of the contained fluid; the integument thins and ulcerates; the fluid contents escape, and the tumor collapses; an asthenic inflammatory action seizes on the spinal cord and its membranes; and the patient perishes either directly in consequence, or by hectic. In the more favorable cases, the tumor may enlarge slowly, if at all; and the child's growth may advance uninterruptedly. Sometimes, by spontaneous ulceration, a very minute aperture is formed, through which the fluid contents slowly drain away, the tumor gradually shrinking, and the parts becoming satisfactorily consolidated.

Curative treatment is attempted only in those cases which afford a reasonable prospect of successful issue. In some cases, it is enough to palliate and prevent increase. In others, we get rid of the swelling, hoping that the fissure in the spinal column may close; or, at all events, that such consolidation shall take place as may effectually prevent recurrence of the protrusion. 1. By steady and uniform support and pressure from without, not only is increase prevented, absorption may also be occasioned; and the tumor having become slowly discussed, an opportunity may be thus given for closure of the vertebral hiatus. 2. Along with the use of pressure, occasional puncturing of the cyst may be practised, so as to expedite the process. 3. The fluid may be at once drawn off with a trocar and canula. And it has been farther proposed subsequently to inject iodine, as for hydrocele. 4. By including the prominence of the tumor in two elliptical incisions, which penetrate the whole thickness of its coverings, the fluid is at once evacuated; and then, on bringing and retaining the margins of the wound in contact by means of suture, such a degree and kind of traction is made upon the parts beneath as may favor, very much, the desired closure of the spinal fissure.[1] In dissecting away the part included in the elliptical incisions, care must be taken to injure the nervous expansions on its internal aspect as little as possible. The head, too, should not be kept high; otherwise the fluid of the sheath is apt to escape too suddenly. This last operation is warrantable only in those cases in which the fissure is slight, and other circumstances are favorable. After such a proceeding, as well as in the modes of treatment by puncture, obviously there is much danger by inflammatory seizure of the spinal contents—which has to be guarded against accordingly.

[1] Dubourg, Gazette Médicale de Paris, Juillet 31, 1841; and Brit. and For. Rev. No. 24, p. 547.

Malignant Disease.

The spinal column has occasionally been found affected by malignant tumor ;[1] an affection which is fortunately rare, seeing that in all cases it must be quite incurable.

Shaw on Distortions of the Spine, Lond. 1823 and 1825. C. Bell on Injuries of the Spine, Lond. 1824. Lawrence on Dislocations of the Vertebræ, Med.-Chir. Trans. vol. xiii. 1825. Teale on Neuralgic Diseases, Lond. 1829. Beale, a Treatise on Deformities, &c., Lond. 1830. Stafford on Injuries, Diseases, and Distortions of the Spine, Lond. 1832. Brodie on Injuries of the Spinal Cord, Med.-Chir. Trans. vol. xx. 1837. Guérin, Gazette Médicale, 1840, Nos. 14 and 15. Hewitt, Cases of Spina Bifida, Lond. Med. Gazette, vol. xxxiv. 1844. Lonsdale on Curvature of the Spine, Lond. 1847. Stanley on Diseases of the Bones, Lond. 1849. Bishop on Deformities of the Human Body, Lond. 1851. Tamplin on Lateral Curvature of the Spine, Lond. 1852. Pirrie, Principles and Practice of Surgery, Lond. 1852. Brodie on Injuries of the Spinal Cord, Med.-Chir. Trans. vol. xxi. Brodie on Curvatures of the Spine, Lancet, No. 1218, *et seq.*

---

[1] Medico- Chirurgical Transact. vol. vi. art. 6.

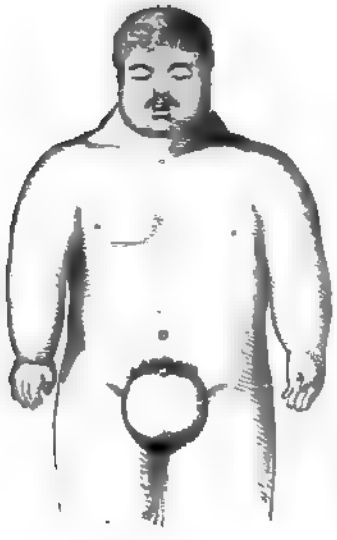
CHAPTER XXV.

INJURIES AND DISEASES OF THE CHEST.

Fracture of the Ribs.

THE ribs are very liable to fracture; by a blow, or fall, or the application of crushing weight; and the ordinary site of injury is near the middle of the bones. The signs are, pain at the part, usually with discoloration and swelling; difficult breathing; full inspiration impracticable, the attempt causing great aggravation of pain, with sudden catching of the breath; crepitus felt, when the palm is held over the part, during respiratory movement. Displacement is seldom great; and is almost always inwards. The injury may be compound, with corresponding wound of the integuments. More frequently it is in a manner compound, by wound of both pleuræ, and consequent communication with the lung, the integuments remaining entire. Under such circumstances, emphysema can scarcely fail to occur, to a greater or less extent; air escaping outwardly from the lung, and becoming infiltrated into the subcutaneous areolar tissue—puffing up the surface of the chest, and probably also extending to the neck. Inflammatory affection of the pleura is not unlikely to supervene, as can readily be understood.

Fig. 168.



General emphysema of the whole surface, after wound of the right side of the chest. (After Larrey.)

The objects of treatment are, to effect and maintain replacement, to prevent motion, and to avert inflammatory or other untoward consequences. A compress is laid along the sternum, so as to make that surface equally salient with the spinous ridge of the vertebræ; and then a broad flannel roller is applied tightly round the chest; the effect of such deligation being to arrest respiratory movement of the ribs, and to force outwards the fragments of the rib or ribs—not only placing them in more accurate contact than they otherwise would be, but also removing their sharp extremities from the pleura, which they might seriously injure. In se-

vere cases, when the cavity of the pleura contains much extravasated blood, bandaging must be conducted with great caution, lest it seriously aggravate the already existing dyspnœa. Rigid antiphlogistic regimen is enjoined; and active antiphlogistics are not delayed, if inflammatory accession threaten in the chest. Cough, sneezing, and other involuntary movements of the part, should be avoided, if possible; and confinement to bed is expedient, during the first few days. The bandaging is likely to limit or prevent emphysema; but if this prove excessive and inconvenient, relief may be obtained by punctures. Ordinarily, it does not occur to a great extent, and gradually disappears, probably by absorption.

Dislocation of the Ribs.

Sometimes, but rarely, the head of the rib is displaced from its connection with the spinal column, without fracture. Displacement is usually slight. And the injury resembles fracture very closely, both in its history and treatment.

Fracture of the Sternum.

The sternum is sometimes broken by direct violence, and displaced inwards. The signs are plain; deformity by displacement being at once discernible, and crepitus taking place during respiratory movement. Treatment is as for broken ribs; but without any compress over the broken bone. And there is the same necessity for watchful anxiety as to the state of the thoracic contents.

Caries and Necrosis of the Ribs and Sternum.

These bones are liable to caries and necrosis, in connection with injury, and as results of mercurial poison—with or without syphilis. The ordinary treatment has to be put in force; except in those cases of chronic caries in which the disease is slight, and has been of very long duration, in a feeble system. Then, sudden suppression of the discharge, by healing, would be apt to prove injurious; and it is well to be contented with mere palliation.

When operation on a diseased rib is necessary, freedom of manipulation is favored by the previous condensation and thickening of those parts which lie between the bone and the pleural cavity.

Hernia of the Lungs, or Pneumocele.

This mal-position may be: 1. *Congenital*, from defective development of the thoracic parietes; 2. *Traumatic*, a wound having left a portion of the parietes open to protrusion; 3. *Consecutive*, following fracture of a rib, or perforation of the chest's wall by abscess; 4. *Spontaneous*, protrusion taking place through an intercostal space, during the exertion of coughing, or through the natural apertures at the root of the neck beside the large bloodvessels. The intercostal spaces most fre-

quently affected are the seventh, eighth, and ninth, at their anterior part.

When slowly formed, the protruded part acquires a sac from the pleura costalis; and, from a small beginning, may come to be of great size—its dimensions greatest during forcible expiration. Auscultation reveals nothing in inspiration; but during forced expiration an intense vesicular murmur is heard, similar to that of normal inspiration, and sometimes accompanied by a kind of crepitant *râle*. At the same time, too, an impulse is given to the hand, and the vesicular "rustling" may be felt as well as heard.

In the traumatic form, reduction is to be effected, if the protruded portion of lung be in a fit state for replacement. Otherwise, it is to be removed by incision. If left to itself, the part will sphacelate, and spontaneous cure may result. No real strangulation, however, occurs; and on this account prognosis is more favorable than in abdominal hernia.

In the other forms, the tumor is reduced, and a firm compress and bandage continuously worn.[1]

Wounds of the Chest.

These may be inflicted by the thrust of a sharp instrument, by the penetration of obtuse bodies, by gunshot, or by fractured rib. Danger is great both at once and secondarily; immediately, by loss of blood, and by entrance of air into the pleural cavity; subsequently, by inflammatory action, and its results. The latter danger is the more serious. And the general statement may safely be made, that in the early treatment active antiphlogistics are mainly to be trusted to; unless decidedly contraindicated by special circumstances of the case. Penetrating wounds by sharp instruments, affecting the lungs, are always formidable by bleeding. But, in the case of an obtuse body penetrating, the elasticity of the lung saves that tissue from injury, which, from a sharp-pointed body, it could not fail to sustain.

1. *Wounds of the Pleura Costalis.*—If the intercostal artery have been wounded, bleeding is likely to be both troublesome and dangerous. The loss may be excessive through the external wound; or blood, accumulating within the pleural cavity, may compress the lung, and constitute a dangerous hæmatothorax. This point, therefore, should engage our first attention. And, to secure the vessel, one of two methods may be adopted. It and its accompanying rib may be included in the noose of a ligature. Or, a linen bandage having been placed over the part, a fold of it is pushed into the wound, between the ribs; and the linen pouch within the pleural cavity is crammed with charpie, by means of a probe or director; then, tightening the bandage, and securing it firmly round the chest, this internal plug is made to compress the vessel and occlude its orifice. But, indeed, the dangers by wound of this

[1] *Vide* M. Merell-Lavallée, Mém. de la Soc. de Chirurg. de Paris, 1847; and Brit. and For. Med.-Chir. Rev. Jan. 1848, p. 133.

vessel seem to have been somewhat overstated; and, in most cases, ordinary hemostatics, it is probable, will not be found to fail.[1]

Entrance of air by the wound, and accumulation of it within the chest, are to be avoided by early and accurate closure of the wound. Otherwise, the condition of pneumothorax becomes established; the lung is compressed, and made to collapse; respiration is consequently rendered imperfect; and the other lung, having suddenly a great amount of additional duty thrown upon it, labors in its function, becomes dangerously congested, may prove apoplectic, or is attacked by violent inflammatory action. These immediate dangers having been surpassed, others remain. The wound, suppurating, may lead to inflammatory affection of the pleura or of the lungs, by extension of the inflammatory process; and this has to be guarded against by antiphlogistic regimen, in the first instance, followed, if need be, by venesection and antimony.

2. *Wounds of both Pleuræ and of the Lung.*—The dangers are still by blood, air, and inflammatory action. There is now a third outlet for the first; by the bronchial tubes, as well as into the pleural cavity, and through the external wound. And the bleeding, coming from so vascular an organ as the lung, is likely to prove formidable. The usual signs of wound of the lung are—a state of system bordering on collapse, difficult breathing, great anxiety of countenance, and expectoration of florid arterial blood. Bleeding is dangerous, by direct loss, and by danger of hæmatothorax; and also by risk of accumulation in the bronchial tubes, or in the trachea, during the stage of collapse. Afterwards comes the peril of intense inflammatory action in lung and pleura. And, lastly, by profuse and continued discharge from the suppurating wound, the patient may perish under the symptoms of phthisical hectic. The first danger is met by rest, quietude, and rigid antiphlogistic regimen; recourse being had also, if need be, to more direct means of controlling the hemorrhage, derivative venesection, nauseants, acetate of lead and opium, &c. (*Principles*, 3d Am. Ed. p. 351). Rallying and reaction having occurred, antiphlogistics come into use, and often not sparingly. Hectic having threatened or set in, a corresponding change must be made in the treatment. The local management is simple throughout. At first, careful examination of the wound is made, in order that no foreign matter may be permitted to remain. Then it is covered by tepid water-dressing, retained by light bandaging. And the patient is laid and directed to remain on the wounded side, so as to favor outward escape of discharge; while by this posture, also, adhesion is favored between the corresponding wounded portions of the two pleuræ, so as to shut off the injured part from the general costal cavity.[2] When contusion exists, as in gunshot injuries, great watchfulness is necessary at the time of the separation of sloughs, lest secondary hemorrhage occur. Small doses of aconite are of use in averting this; by subduing the febrile excitement of the circulation which usually precedes. Emphysema may occur in one of two ways, but is seldom such as to require direct treatment. Air, escaping from the pulmonic lesion,

[1] Guthrie on Wounds of the Chest, p. 104.

[2] Ibid. p. 68.

may not be wholly discharged externally; or, in a valvular form of external wound, air may enter more readily in inspiration than it can escape during expiration; and, in either case, a portion is liable to be infiltrated into the subcutaneous areolar tissue.

Hæmatothorax.

This term denotes an accumulation of blood in the pleural cavity, causing compression of the corresponding lung, and the dangerous consequences of this, already noticed. It may be produced by spontaneous escape of blood, through ulceration, as in aneurism; much more frequently it is of traumatic origin, by wound of the lung, or of an intercostal artery. It may be either simple or compound; the latter, if the result of a penetrating wound; the former, if caused by puncture of the lung in a case of fractured rib, with much displacement of the sharp ends of the bone, the integument remaining entire. According to the extent of accumulation, respiration is more or less oppressed; there is dulness on percussion on that side, and no respiratory murmur can be heard; on the opposite side, respiration is *puerile;* the patient lies only on the affected side, and the corresponding cheek has often been observed of a purple color; the countenance is anxious; the general surface is cold, pale, and bedewed by clammy sweat; and there is feeble pulse, with cold extremities, and other signs of serious loss of blood (*Principles*, 3d Am. Ed. p. 356).

[Valentin observed in several cases of hemorrhage into the thoracic cavity, that an ecchymosis occurred at the angle of the false ribs, and spread towards the loins. The ecchymosis is described as of a clear purple hue, like the spots which sometimes appear on the abdomen shortly after death. (*Cooper's Surgical Dict.* 7th ed. p. 1494.) But this sign is not always present in intra-thoracic hemorrhage; and it cannot compare in point of value with the evidences elicited by auscultation and percussion, taken in connection with those of the constitutional effects produced by considerable loss of blood.—Ed.]

If the affection be not compound, and slight in other respects, treatment is analogous to that of sanguineous collections in the external parts of the body, following bruise. Wound of the surface is carefully abstained from, and gradual disappearance by absorption patiently awaited (*Principles*, 3d Am. Ed. p. 691). Venesection is advisable, unless when specially contraindicated; first, to arrest bleeding, and so to limit the accumulation; secondly, to diminish the amount of circulating fluid in the laboring sound lung, and at the same time to avert or mitigate inflammatory action in all the injured parts. If, however, the accumulation be obviously great—as evidenced by the amount of dulness and fulness of the side, and by the oppression in breathing—it becomes necessary to afford the confined blood means of escape, by making a suitable opening in the parietes.

In the compound form, the wound is kept open; and means are taken to arrest the bleeding at its source, and at the same time to assist the respiration; and inflammatory symptoms are timeously opposed.

[For the arrest of hemorrhage from a wound of the lung, the same

principles of treatment, both general and local, are applicable as to bleeding from other sources. One of the most effective local hæmostatics is *compression*. We cannot directly bring this means to bear upon the lung; but we can induce the lung to *collapse*, and thus effectually compress its vessels. So long as the external wound is allowed to remain open, the blood which escapes from the lung will of course flow out of the chest, especially if the patient be directed to lie upon the wounded side, as advised in the last section, and the lung will continue to be expanded. But if the external orifice be closed, in addition to the other means recommended, the lung will be gradually compressed against the spine, the blood will slowly coagulate, and thus the bleeding will be stopped. We cannot but think, therefore, that the advice given in the text, *to keep the wound open*, is injudicious.

Another mode by which, in case of emergency, and where death from hemorrhage seems imminent, we may induce collapse of the lung and consequent compression of the pulmonary vessels, is to allow the air to enter freely through the external wound, which, indeed, would be the case in every instance of penetrating wound of the chest, if the orifice were large enough. But in many cases the wound is small, so that the presence of flowing blood in it, and of the lung in apposition to it behind, prevent the entrance of air. The remedy in such cases is manifestly to enlarge the wound, taking care to avoid cutting the intercostal artery.—Ed.]

Pneumothorax.

This denotes accumulation of air in the pleural cavity. The case may be either medical or surgical; the latter dependent on wound of the lung; the former caused by perforating ulcer, connected with tubercular abscess. The traumatic form is the result of penetrating wound, oblique and valvular; or of fractured rib, displaced inwards. It has also resulted from mere bruise of the chest; the lung and pleura pulmonalis having giving way by rupture. Its signs are: absence of the respiratory murmur on the affected side, with a peculiarly clear resonance on percussion; the ribs are fixed; and, on the opposite side, respiration is puerile, as in the preceding affection. In the medical form, there is usually fluid as well as air in the chest; consequently, a splashing of this fluid is heard, on succussion; and coughing produces a ringing sound, termed metallic, or amphoric resonance.

Treatment consists in affording ease to the working lung, and averting inflammatory action. Judicious loss of blood, as already seen, conduces powerfully to both objects. In urgent cases, an outward escape is to be afforded to the air, by acupuncture, or by the thrust of a small trocar and canula.

Emphysema sometimes coexists with Pneumothorax. It has been already considered, incidentally.

Paracentesis Thoracis.

Puncture of the thoracic parietes may be required, we have seen, on account of accumulated air or blood in the pleural cavity. It may also be called for in consequence of fluids having collected there—the result of inflammatory action—Hydrothorax and Empyema; diseases which belong to the department of the physician, and which it is consequently unnecessary to consider here. In empyema, the side is found dull on percussion and swollen, and the ribs are unusually separate; there are dyspnœa, difficulty of lying on the sound side, and the other signs of pleural accumulation already noticed; the side enlarges more and more; fluctuation comes to be discernible in the intercostal spaces; and, ultimately, by ulceration at the most prominent part, spontaneous evacuation may take place, as in ordinary abscess.

For the discharge of purulent and sero-purulent fluids, an opening is made by means of a trocar and canula. This instrument may be employed, subintegumentally, as in the case of chronic abscess (*Principles*, 3d Am. Ed. p. 216). Or the opening may be made direct, and left patulous and dependent. However made, the margins of the ribs should be carefully avoided, especially the lower, lest wound of the intercostal arteries occur. In the direct puncture, it is well to make an incision through the skin and muscular stratum, by means of a scalpel; merely completing perforation by the trocar. As to the most eligible point for making such a wound, authorities greatly differ. The opening must be dependent, and sufficient in all respects for evacuation; and yet it must not be so placed as to endanger the diaphragm, though this muscle, it is to be remembered, is usually displaced downwards very considerably by the accumulation, and is farther protected by the patient being directed to inspire during the act of puncture. The space between the fifth and sixth ribs is frequently chosen, midway between the spine and sternum. Some prefer that between the seventh and eighth; others operate between the sixth and seventh. Some go as high as between the fourth and fifth ribs, having observed that natural pointing not unfrequently takes place there. Of late, the space between the sixth and seventh, or that between the seventh and eighth has been opened, by cautious dissection and the thrust of a small trocar, at the most dependent part, below the lower angle of the scapula. The patient is placed with the side prominent and dependent; and arrangements are made for turning him on his face, should oppressed respiration ensue. In the case of direct opening, permanency may seem preferable to closure and reopening; and this is secured by suitable dressing of the wound. To favor discharge, the patient remains recumbent on the affected side. If closure be attempted, the greatest care must be taken to avoid the entrance of air; the patient is exhorted to shallow breathing; the canula is withdrawn before all the fluid has escaped; and the wound is instantly shut up.

The physical signs of hydrothorax are not dissimilar from those of empyema. And often very marked benefit may be derived from paracentesis. Accumulation having proceeded so far as greatly to embarrass

breathing, the patient is arranged as already described, and by means of a *small* trocar the serum is cautiously withdrawn; the utmost care being taken to prevent entrance of air into the pleural cavity. Enough having been removed, the puncture is treated so as to secure immediate union. And, subsequently, the operation may be repeated, if necessary. Relief is certain, for the time; and in not a few cases this adaptation of surgery to medicine seems to have been instrumental towards a permanent cure.

[The important pathological differences existing between *Hydrothorax*, whether the result of inflammation or of passive transudation of serum, and *Empyema*, and the fact that the operation of paracentesis is more frequently called for in the latter than in the former affection, for the simple reason that this is more amenable to the ordinary medicinal treatment than that, render it expedient to set forth more clearly the means of diagnosis between the two.

Although there is a considerable degree of resemblance between the phenomena of these affections, yet, in empyema, the duration of the symptoms, and physical signs, is commonly longer than in hydrothorax, and the progress of the case is usually more slow and gradual; and in hydrothorax, from passive transudation, there is, in most cases, a lesion of the heart, or of some other important organ, sufficient to account for the collection of fluid in the chest, which is affected in common with other serous cavities and the areolar tissue generally. In empyema, the constitutional disturbance ordinarily assumes the form of *hectic fever*. The *physical signs*, too, are somewhat different in these two affections, and, taken in connection with the general symptoms, will almost always determine the character of the complaint. In empyema, there is frequently much greater prominence of the diseased side of the chest, and of the lower intercostal spaces, than in hydrothorax. The reason of this is probably as suggested by Dr. Stokes (*Diseases of the Chest*), that these are more relaxed, and their tonicity and muscular contractility more impaired in empyema, in consequence of the more protracted duration of the inflammation; and, moreover, the specific gravity of the fluid is greater, and consequently the pressure exercised upon the walls of the chest is more considerable. Again, the superficial veins of the chest are more frequently distended and tortuous in empyema, because the free return of venous blood to the heart through the ascending cava is interfered with, by the pressure of the fluid and the collapsed lung upon this vein—the pressure being greater in empyema than in hydrothorax, because the fluid is of greater density.[1] Besides, the imperfect decarbonization of the blood by the respiratory process, renders it necessary that the liver shall perform more than its ordinary task; hence, this organ becomes more or less congested, and the portal circulation embarrassed, unless the redundant blood shall find its way back to the right auricle by the superficial venous channels.[2] In many cases of empyema, uncomplicated with any active disease of the lung, and in which there was no fistulous communication between the pleural sac and

[1] Pepper, Cases of Empyema, reported in the American Journal, for January, 1852.
[2] McDonnell, Dublin Journal, March, 1844.

the bronchial tubes, *purulent expectoration* has been observed, which has not, so far as we know, been noticed in hydrothorax. This phenomenon may very probably be explained by the long-continued congestion of the bronchial mucous membrane, which seeks to relieve itself by the purulent discharge.[1]

But empyema may be confounded with other diseases than hydrothorax; with *encephaloid degeneration of the lung*, with *enlargement of the liver*, with *pulmonary phthisis*. From the first, it may be distinguished by the absence of symptoms which generally accompany encephaloid disease of the lung, *e. g.* the currant-jelly-like sputa, and the cancerous cachexia, with external cancerous tumors; and when the lungs are thus diseased, tumors of an analogous kind are apt to be present in the mediastinum, producing pain in the neck and shoulders, œdema of the face and integuments of the chest, pressure upon the œsophagus and trachea, &c. &c. From *enlargement of the liver*, it differs in the locality and character of the physical signs, and in constitutional symptoms; and in the absence, in the last disease, of the dislocation of the heart, and of the prominence of the intercostal spaces. The history of the case, the evidences of the tubercular cachexia, with its usual concomitant, enlargement of the cervical lymphatic glands, the commonly diseased condition of the lung of the other side, and the presence or absence of the physical signs of the existence of pleuritic purulent effusion, will ordinarily enable one to distinguish between pulmonary phthisis and empyema. But it is important to bear in mind that these two diseases may, and often do, coexist.

If the surgeon is still in doubt as to the nature of the case, after having examined the patient in the ordinary manner, he may resort to an *exploratory puncture*, as recommended by Dr. Davies;[2] and having thus satisfied himself of the actual condition of things, complete the operation or not, according to the information he has gained by the puncture.

The existence of fluid in the pleural sac having been determined, the treatment to be instituted for its removal becomes a matter for serious consideration. If the fluid be serum, or sero-albuminous, constituting *hydrothorax*, a reasonable hope may be indulged, under favorable circumstances, that it will be removed by absorption, no matter how large the quantity may be. But this is not always accomplished, as is evident from the fact that many persons die of hydrothorax. Thus, Dr. Boyd, in the course of three years, opened the bodies of twenty-four persons, who died of this affection, in the St. Marylebone Infirmary, and of twelve others, in each of whom he found evidences of pleurisy and effusion.[3] The patients may have been so much reduced by the pleurisy, or the fluid may so much interfere with respiration, and secondarily with other important functions, from its amount alone, or it may have so rapidly accumulated, that absorption cannot take place under the most favorable hygienic circumstances, and the most judicious

[1] Pepper, *op. cit.*; also, McDonnell, *op. cit.*
[2] Watson's Lectures, Philad. 1851, p. 598.
[3] Roe, on Paracentesis Thoracis, Med.-Chir. Transac. vol. xxvii. p. 212.

medical treatment. In such cases, the operation of tapping the chest should be resorted to, to prevent suffocation.

But when the fluid consists more or less entirely of pus, constituting *empyema*, there is much less probability that it will be removed by absorption. There is here a physical impediment to absorption, in the fact that the pus-globule is too large to be taken up by the vessels, unless it has previously undergone some change, whereby it becomes broken down, disintegrated, or otherwise modified (*Principles*, 3d Am. Ed. p. 145). The watery portion of the pus may be removed in this manner, and hence, we not unfrequently see in the pleural sac, after death from pleurisy, a semi-fluid matter, consisting almost wholly of pus-globules and masses of fibrine—the portion which the absorbent vessels could not take up, even had the surrounding serous membrane been in a normal condition, much less when covered, as it commonly is in such cases, by an incompletely vitalized and imperfectly organized layer of adventitious matter effused by the inflammation. In common abscesses upon the surface of the body, every one knows how rarely pus is absorbed; so much so, that, so soon as the surgeon is convinced that suppuration has actually commenced, his plan of treatment changes, he ceases to endeavor to promote the absorption of the effused fibrine, but applies warmth to the part, favors the conversion of the fibrine into purulent matter, the approach of the latter to the surface, and evacuates it by an incision. The progress of internal suppuration is rarely different. Dr. Pepper says (p. 49 of his paper): "When it is remembered that our therapeutic agents have but little influence in promoting the absorption of pus—that these agents, such as mercury, purgatives, &c., are contraindicated in the impoverished state of the system which attends empyema, and that, even supposing the pus might be absorbed, nothing but the most disastrous effects could result, such as metastatic abscesses, and other consequences of purulent infection, it certainly does not appear reasonable to procrastinate, in the forlorn hope that the unaided efforts of nature may open some safe channel for its escape," through the walls of the chest, or by vicarious action of the bronchial or intestinal mucous membrane, as seems occasionally to have been observed. (*Stokes*, *McDonnell*, *Pepper*.)

In the majority of cases, the operation of paracentesis thoracis has not been resorted to until no other hope seemed to be left; when the lung had become more or less altered in structure, perhaps irremediably so, the patient's health and strength seriously if not permanently compromised, and his very existence endangered from suffocation. And yet, as we shall presently show, under these very unfavorable circumstances, the success of the expedient has been equal to that of most other important surgical operations. Is it not reasonable to infer that, had it been earlier undertaken, before so much valuable time had been wasted, and so much injury inflicted upon the parts concerned, and upon the patient's constitution, its success would have been even greater?

Probably the most commonly accredited objection to the operation consists in the fact that air is admitted to the pleural sac, whereby the pus is supposed to undergo some change which diminishes very materially the prospect of recovery. But it is evident that too much importance

has been attached to this circumstance, for practical men have not found these bad consequences to ensue so commonly as has been predicted. Thus, Mr. Fergusson says (*Practical Surgery*, Philad. 1853): "Whatever care may be taken to prevent the ingress of air, the occurrence is extremely likely to happen. I must say, however, from my own experience, when this has happened, that I have not seen any evil follow directly therefrom." The testimony of Dr. Roe is still more important; he refers to twenty-four cases, nine of which were instances of purulent effusion, and says: "In every case which has fallen under my observation, a considerable quantity of air entered into the pleura during the operation, and in some of them so freely as to excite all the physical signs of pneumothorax; but in none of them did it produce any permanently evil effect, a few hours being sufficient for its spontaneous removal; in one instance only did it cause even temporary inconvenience. (*Op. cit.* p. 204.)

The success of the operation has been much greater than is commonly supposed. Dr. Roe, in the paper just cited, has collected all the cases published in the English language between 1812 and 1832; they are thirty-nine in all, of which number eleven died; twenty were examples of empyema, of which fourteen were cured, and six died; thirteen of hydrothorax, of which eight were cured, and five died; two had hydatids, both of which were cured; in four, the character of the fluid was not stated, but they all recovered. In none of the thirty-nine cases did the operation prove fatal; in one, however, the patient died on the day following it from suffocation, owing to the accumulation of air in the pleura, which might have been removed, as Dr. Roe states, by pumping with a syringe, as was done in one of Dr. R.'s own patients. In another table, he records twenty-four cases operated on by himself, or his friends, since 1833; of these, eighteen recovered, and six died; nine were cases of empyema, of which eight recovered, and one died; thirteen of inflammatory hydrothorax, of which nine recovered, and four died; one of mechanical hydrothorax, which was relieved; one of pneumothorax, which died. Taking the two tables together, the results of the operation will stand thus: the whole number of patients operated upon was sixty-three, of whom forty-six recovered, sixteen died, and one was relieved; of these, twenty-nine had *empyema*, of whom twenty-two were cured, and seven died; twenty-seven had *hydrothorax*, of whom seventeen were cured, nine died, and one was relieved; two had hydatids, of whom both were cured; in four, the nature of the effusion was not described, but all recovered; one had pneumothorax, who died. Dr. Roe likewise quotes a memorandum given him by Mr. B. Phillips, in which this distinguished surgeon says: "Among my notes of the result of this operation, I find a record of one hundred and twenty-two cases, of which eighty-eight were cured. I find particularized thirty-one cases of pyothorax, of which twenty-six were cured; and nine cases of hydrothorax, of which six were cured."

Dr. Davies reports sixteen cases of empyema operated on, of which twelve recovered. In three of the less fortunate cases, the lung could not expand after the evacuation of the fluid, in consequence of the thick-

ness of the false membranes covering it.[1] It is possible that had the operation been performed earlier in these three unsuccessful cases, the results would have been more happy.

In none of the cases cited did the operation prove fatal; it is not a painful one; and it is evident that its ultimate success is equal to that of most others of importance undertaken by the surgeon. Dr. Roe, in reviewing his twenty-four cases, concludes thus: "The total mortality proportioned to the whole number of cases, viz.: six in twenty-four, is less than that which occurs after most operations; and yet it is more than can be fairly laid to the charge of paracentesis thoracis, as one of the deaths was from phthisis, another from pneumothorax, and a third from mechanical hydrothorax; for none of which diseases have I advocated the operation as a curative measure. Deducting these three cases, the mortality will be three deaths out of twenty-one cases," (p. 234, *op. cit.*)

Paracentesis thoracis may therefore be advised and performed, either as a *curative* or as a mere *palliative* operation. *Curative*, in cases of *empyema* and *inflammatory hydrothorax*, uncomplicated with chronic diseases of the lungs, or other important organ; *palliative*, merely, when such disease does coexist with the pleural effusion, and in *mechanical hydrothorax*, where the effusion into the chest is a mere symptom of serious lesion of the heart, or of some other important organ, which causes the serous transudation into the pleural cavity, and which will ere long itself cause death, even though the accumulated fluid be removed by the operation under consideration. In these last cases, however, this expedient may be properly resorted to, in order to prolong life; and even, in some cases, with the hope that when the depression induced by the pleural accumulation is removed, the system may overcome the local disease which occasioned it.

The proper time for resorting to the operation is a very important point. In cases of *inflammatory and mechanical hydrothorax*, simple, or complicated with pneumothorax, tubercular disease of the lungs, or other pathological conditions, it may be postponed until it seems necessary to resort to it to relieve impending suffocation, or until proper remedial means, which commonly relieve curable cases, have been tried. But, in instances of *empyema*,

> "If it were done, when it is done, then it were well
> It were done quickly;"

and we have shown, we think, that not only is the operation not attended with danger, but that it is highly successful. Not only does long delay very generally do no good, so far as spontaneous removal of the fluid is concerned, but it is productive of positive injury. The longer the procrastination, the greater the probability that the lung will become thoroughly carnified, firmly bound down to the spine, atrophied, and otherwise unfitted for resuming its duties as a respiratory organ, even after the fluid shall have been removed by operation, or otherwise; the greater also the liability of thickening and degeneration of the pleura,

[1] Watson's Practice, Philad. 1851, p. 600.

of necrosis or caries of the ribs, of tubercular deposition into the lungs;[1] and the more exhausted and diseased will the patient become, from long-continued hectic, which, of itself alone, without the induction of incurable disease of any organ, will, in the majority of cases, unless the cause be removed, occasion premature death. Dr. Roe says that, in his experience, "the success of the operation was directly in proportion to the shortness of the time which intervened between the accumulation of the fluid and the performance of the operation; and that, when it was unsuccessful, the chief cause of its failure was its being postponed until too late a period. The very fact that, with the exception of one case of pneumothorax, death occurred only where the effusion had been of very long standing, suggests the opinion that the failure of the operation may be attributed to the duration of the disease; the contracted state of the lung, and other changes which the thoracic viscera are known to undergo from the long-continued pressure of the effused fluid, leads to the conclusion that we ought not unnecessarily to delay the operation a single day," (p. 235, *op. cit.*) On looking over Dr. Roe's tables, we find that the whole number of operations performed, the dates of which, from the commencement of the disease, are recorded, exclusive of those performed in phthisical patients, and in those with pneumothorax, was forty-two; of these, thirty-two were successful, and ten unsuccessful. These cases may be arranged as follows:—

	TOTAL.	CURED.	DIED.
Operations performed after a month or less . . .	12	10	2
" " between one and two months . .	9	9	0
" " " two and three " . .	2	2	0
" " " three and four " . .	6	4	2
" " " four and five " . .	4	2	2
" " " six and seven " . .	3	2	1
" " " eight and nine " . .	3	1	2
" " after three years . .	1	1	0
" " " seven " . .	1	1	0
" " " "a long time" . .	1	0	1
	42	32	10

Or, of twenty-three operations performed within the first three months of the duration of the effusion, twenty-one were successful, and two unsuccessful; while of the nineteen resorted to later than this, eleven only were successful, and eight unsuccessful. Dr. Roe advises that the operation should not be postponed beyond three weeks, believing that, after this period, there will be great danger that changes will have taken place in the lung and pleura, which will render the complete cure of the patient doubtful. He says: "No case occurred in my practice in which, after the lapse of five or six weeks from the commencement of the effusion, a patient was *perfectly cured*;" *i. e.* in which his lung perfectly recovered its normal capacity, and healthy respiration was regained. And it is, of course, highly important that something more should be gained by the operation than the simple removal of the fluid.

We have seen that the admission of air to the pleura, during the ope-

[1] Williams, Library of Pract. Medicine, Art. Empyema; Pepper, in paper before quoted, &c.

ration, is productive of less injury than is usually feared. But, in order to prevent its entrance, it has been recommended to perform the operation while the patient is in a bath, the chest being under water; various instruments have also been invented for this end. Of these, we would mention the contrivance of Dr. Wyman, of Cambridge, Mass., a drawing of which is exhibited in a valuable paper on "Pleuritic Effusions and on Paracentesis Thoracis," by Dr. Bowditch, of Boston, in the *American Journal*, for April, 1852.

After the evacuation of the fluid, the operation for which may be repeated, if necessary, a treatment suited to the condition of the patient must be instituted.—Ed.]

Wounds of the Heart.

These have been already alluded to (*Principles*, 3d Am. Ed. p. 339). They generally prove fatal; but are not necessarily so; and, therefore, are amenable to the general principles of treatment formerly detailed (*Principles*, 3d Am. Ed. p. 351).

[*Paracentesis Pericardii.*

M. Velpeau doubts that this operation has ever actually been performed (*Operative Surgery*, vol. iii. p. 520, Am. Ed.); but does not question the feasibility or even the propriety of the proceeding. It should, of course, be reserved for urgent cases only, and where proper treatment by ordinary means has failed. Mr. Walshe says: "Paracentesis of the pericardium becomes justifiable, as an *ultima spes*, provided urgent suffocative symptoms exist. The patient is certainly not placed in a worse position by the operation than he was before it; the immediate relief is extreme, and a certain very small chance exists of at least a temporary recovery."[1]

The diagnosis of the condition of the pericardium can be determined upon with great certainty; so that an objection on that ground cannot now be maintained.

The mode of opening the pericardial cavity is a point concerning which different opinions are entertained. It may be accomplished by trephining the sternum an inch above the xyphoid cartilage, as recommended by Riolan, Laennec, &c.; in this operation, the internal mammary artery is not endangered, and the distended sac is perfectly accessible. Others advise that the opening be made at various points on the left of the sternum, between certain of the intercostal spaces. M. Velpeau prefers the procedure of Riolan. The trephining having been effected, the left forefinger should be introduced into the opening to substantiate the existence of fluctuation, and to serve as a guide to the bistoury; the sac having been incised, the patient should be turned on his left side, and the fluid allowed to escape. (Velpeau, *op. cit.*)

Mr. Walshe says: "Were the operation determined on, a trocar should be cautiously introduced, perpendicularly to the surface, at the lower

[1] Diseases of the Lungs and Heart, p. 452, London, 1851.

angle of the left fourth interspace close to the sternum. The fluid which escapes by jets, corresponding to the ventricular systoles, should be evacuated as completely as possible before the wound is closed—a syringe may even be employed to insure this. But the orifice of the canula, before its removal, should occasionally be closed, lest too rapid removal of the fluid might produce evils of its own on the heart, accustomed as this has been, for a greater or less time, to considerable pressure." (*Op. cit.*)

Dr. Smith states, in his *Operative Surgery*, p. 381, on the authority of a manuscript letter from Dr. J. C. Warren, of Boston, that this gentleman has once *successfully* performed this operation. The mode of operating in this case is not described.

Of course, the operation is expected to produce only temporary relief; the cure of the disease must be sought after by proper constitutional and topical treatment.—Ed.]

Hennen, Military Surgery, Edin. 1820. Mayer, Tractatus de Vulneribus Pectoris, &c. Heidleb. 1823. Quesnay, Dissertatio de Hæmorrhagia Arteriæ Intercostalis Sistenda, Berol, 1823. Larrey, Mémoires de Chir. Militaire, vol. ii. and Mémoires de l'Acad. Royale de Médecine, Paris, 1828. De Jong, Diss. de Vulneribus Cordis, Groning, 1838. Guthrie on Wounds and Injuries of the Chest, Lond. 1848. Richerand, Nosog. Chirurg. vol. iv. p. 3. Dict. des Sciences Méd. vol. iv. p. 217. Dupuytren, Leçons Orales, vol. ii. Cock and Hughes on Paracentesis Thoracis, Guy's Hospital Reports, Second Series, No. iii. Lond. 1844.

CHAPTER XXVI.

AFFECTIONS OF THE MAMMA AND MAMMILLA.

Irritable Mamma.

The female breast is not unfrequently the seat of irritation (*Principles*, 3d Am. Ed. p. 89); giving rise to much local uneasiness, and tending also to involve the system in serious disorder. The gland is nowise altered in structure; sometimes there is slight puffiness in the superficial areolar tissue. The pain is very considerable; not constant, liable to exacerbations—often periodic—and otherwise evincing the ordinary characters of neuralgia. Aggravation generally occurs at the menstrual period. The patient is young or of middle age; and usually is pale, thin, and cachectic.

The affection is to be considered as symptomatic of more serious disease, and treated accordingly. In the majority of cases, the uterus is to blame—disordered either in structure or in function; and, until this source of evil be rectified, all other treatment will prove of little avail. In cases of functional derangement, the preparations of iron are indicated. Conium is of service in allaying the general irritation of system. Locally, the endermic use of nitrate of silver, so as merely to blacken, often affords relief; and belladonna, aconite, and prussic acid may be used in the form of ointment, liniment, or plaster. Change of air, exercise, attention to diet, and the other ordinary correctives of chronic disease, are of great importance. In some cases the symptoms seem dependent on neuromatous formation in the neighborhood of the gland; and under such circumstances, cure may be readily effected by excision of the superficial tumor.

Mammitis.

1. *Acute.*—Acute inflammatory action in the mamma may result from external injury, exposure to cold, or any of the other ordinary excitants; most commonly it is connected with lactation. The pain and other local signs are intense; fever is proportionally severe; and suppuration is from the first imminent. The secretion of milk is first perverted, and then arrested. Matter, when formed, is seldom limited to one part, pointing rapidly there; but rather tends to pervade the whole gland, pointing slowly; and the abscess, after having become open, is liable to degenerate into the condition of sinus (*Principles*, 3d Am. Ed. p. 218).

In the outset, leeches are applied in abundance, with hot fomentation; and the gland is carefully supported by a soft handkerchief or shawl, passed beneath it and around the neck. Small doses of sulphate of magnesia, in acidulated solution, assist antimony in subduing the febrile state, and, at the same time, have the salutary effect of opposing determination of blood and consequent hyper-secretion in the gland. When resolution is to take place, this may be accelerated by gentle friction. When matter has formed, early evacuation should be made; for thus only may future severities by incision be prevented. In severe or neglected cases, the gland may be, as it were, dissected out by the matter separating its component parts; or many sinuses may form, communicating with each other, intersecting the whole mamma, and mixed up with intercurrent abscess. Such sinuses do not require to be each incised throughout its whole extent—the knife following mercilessly on the probe; it is enough to secure satisfactory evacuation by suitable counter-opening, and then by pressure to favor contraction of the cavities. In this, we generally succeed; and continuance of the pressure is farther useful, in promoting discussion of the morbid parenchyma in which the sinuses are placed. It may be applied by bandaging, by careful application of strips of adhesive plaster, or by means of air or water contained in caoutchouc tissue, as recommended by Mr. Arnott.

2. *Chronic.*—The mamma is subject to enlargement and induration, by reason of a slow, painless, and minor amount of the inflammatory process. The whole gland may be effected, or only a part. Young adults are most liable. The swelling is more diffuse than any form of genuine tumor; and is little painful, even on manipulation; it feels as if composed of numerous small granules, and has the negative character of wanting the local and constitutional signs of carcinoma. Treatment consists, locally, in light antiphlogistics, followed perseveringly by discutients; constitutionally, in attention to the general health, and to the uterine functions, by alteratives, tonics, &c.

Galactirrhœa.—By this term is understood a persistent and excessive secretion of milk; whereby emaciation, debility, and even hectic may be induced. To arrest and remove this condition, iodine given internally seems to possess almost a specific power; suckling being of course desisted from, and the uterine functions restored.

Chronic Abscess.

Chronic abscess is not unfrequently found of a somewhat peculiar character in connection with this gland; consisting of a firm cyst, containing a small quantity of thick creamy-looking pus; existing for months or years, and enlarging slowly if at all; situate sometimes in the gland, more frequently beneath it; firm, because tense, to the touch; and closely simulating a solid tumor. It may be treated either by subintegumental or by direct puncture; or, an error of diagnosis having been committed, and a free incision having been made, the cyst may be dissected away—as if a tumor.

Lacteal Tumor.

One or more of the lacteal tubes are liable to distension, by occlusion of their orifices; giving rise to a swelling analogous to ranula in its formation. The contents are milky during lactation; at other times serous and fluid, or caseous and solid—or partly so. The swelling has a fluctuating feel, and extends, radius-like, from the nipple outwards; often it is of a conical form, the apex towards the centre. Treatment is by puncture, near the nipple; keeping the opening pervious. Should inflammatory action take place, inducing obliteration, the occurrence need not be greatly deplored.[1] Sometimes abscess forms; requiring the ordinary treatment.

Hypertrophy.

The mamma is liable to hypertrophy, at the period of puberty; usually, with an unsatisfactory condition of the menstrual secretion. Sometimes a state resembling nymphomania attends. The undue amount of development may usually be got rid of, by attention to the general health, and to the uterine functions—aided, if need be, locally, by gentle leeching, followed by discussives. Of these latter none are so effectual, locally, as pressure; and this is very conveniently applied by means of the hydrostatic apparatus of Dr. Arnott.

Pendulous Breast.

The pendulous breast is an affection of advanced years; being but an exaggeration of the ordinary dug-like condition which this organ so generally assumes, in those who have borne children, and who habitually neglect support of the part in dress. The only warrantable treatment is palliation by suspension and support.

Partial Hypertrophy.

This is the "chronic mammary tumor" of Cooper. A portion of the gland becomes hypertrophied, with ultimate change of structure—yet simple; and enlargement of the lobules takes place usually from the outward surface, constituting a soft unequal tumor. It is peculiar to the young adult, seldom, if ever, appearing after thirty years of age; and is almost always connected with disorder of the uterine system. Treatment is the same as for general hypertrophy. Marriage, followed by pregnancy and suckling, sometimes proves a successful means of cure.

The tumor, though originally most simple, is liable to degeneration. Consequently, when ordinary discussive means have failed, after due trial, it should be regarded as other tumors not amenable to discussion. "Common snakes are killed, because vipers are dangerous."

[1] I have known this simple morbid condition prove the precursor of inveterate carcinoma in the gland.

Various Tumors.

The gland may be the seat of *Simple sarcoma*. The treatment is first by discussion; and, if that fail, by excision. *Fibrous tumors* have a favorite site here. Though less liable to degeneration than any other morbid growth, they are certainly not exempt from that untoward occurrence; and, therefore, except in the aged, it is well to remove by operation, that which can never grow better and may grow worse (*Principles*, 3d Am. Ed. p. 309). *Cystic sarcoma* is very common. Like the simple mammary tumor, it is most frequent under thirty years of age, and prevails chiefly among the better classes. The tumor is composed mainly of serous cysts, the parenchyma consisting of little more than the substance of the gland slightly altered. And there is some reason to believe that these cysts may sometimes originate in partial lacteal dilatation. By puncturing the cysts; and afterwards applying pressure, the tumor may diminish, consolidate, and gradually disappear, in the minor cases. But when the whole gland is involved, extirpation should be at once had recourse to; not only because other treatment will prove unsuccessful, but because such tumors are well-known to be peculiarly prone to degenerate, more especially when irritated (*Principles*, 3d Am. Ed. p. 304). *True Hydatids* are also found in the gland. When single, they may be got rid of by puncture. When numerous, ablation of the part is expedient. The *Malignant tumors* of the mamma are unfortunately of proverbial frequency; more especially carcinoma.

Fig. 169.

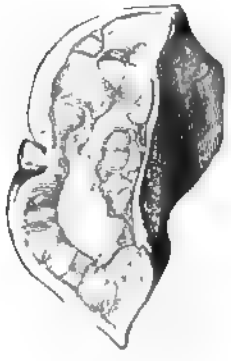


Fig. 169.—Carcinoma of the Breast, bisected. The figure of the tumor, with its effect on the gland and nipple shown.

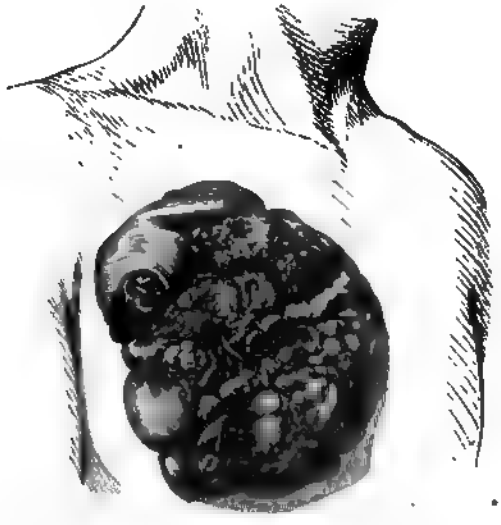
Fig. 170.

Fig. 170.—Carcinoma; secondary. An example of the numerous nodulated tumors, which often form in the cicatrix of the former growth. One is ulcerated in the site of the mammilla.

The general description of this tumor (*Principles*, 3d Am. Ed. p. 310), is not departed from; the chief peculiarity being in the nipple, which, early involved, is remarkably retracted and shrivelled in appearance. The glands of the axilla, too, are liable to be soon affected. The disease is known by the age of the patient, the hardness of the tumor, the character of the pain, the rate and mode of growth, the involvement of

the skin and retraction of the nipple, the cachectic state of the system as evidenced by the countenance and general appearance. The only cure is by extirpation; but, as formerly explained (*Principles*, 3d Am. Ed. p. 317), it is only a small number of the many cases which present themselves to the surgeon, which warrant operation; and it may be well to repeat here, that if the skin be much involved, if the nipple be much retracted, if there be a marked depression over the tumor, if the open condition be arrived at, if there be adhesion of the tumor to the pectoral muscle or to the ribs, if there be ominous signs of some obscure yet serious disorder proceeding within, and if there be glandular affection without—these, being all singly most unfavorable, and betokening relapse, do most certainly, when coming together, contraindicate all operative interference.

Fig. 171.



Fungus Hæmatodes of Mamma; fungoid, bleeding, and blood-like.

Extirpation of the Mamma.

The patient having been placed recumbent, and duly anæsthetized, the arm on the affected side is raised and held by an assistant, so as to stretch the pectoralis major, and facilitate incision. The knife is entered on the axillary aspect of the tumor, in a line with the mammilla, and is moved in a semi-elliptical direction towards the opposite point; a similar proceeding is adopted, above or below, as the case may be, to complete the ellipse; and the size of this space necessarily varies, according to the extent to which the integument seems to be involved, and according to the natural laxity of the parts. It is a fault to take away an undue amount of sound textures, so that difficulty is experienced in effecting and maintaining apposition of the wound; but it is a worse

error to leave tainted parts, whereby reproduction of the disease cannot fail speedily to ensue. It is well to make the lower incision first, otherwise its course and position are apt to be uncertain, under the irrigation of blood. Then, on each aspect, the knife is sloped through the subcutaneous fat, and regular dissection is proceeded with from the axilla downwards, dividing the principal vessels and nerves at once, and so rendering the subsequent steps of the operation comparatively bloodless and free from pain (*Principles*, 3d Am. Ed. p. 329). The diseased mass, with its border of apparently sound tissue, in the case of malignant tumor (*Principles*, 3d Am. Ed. pp. 317 and 329), having been removed, is carefully examined on every aspect by both sight and touch; and, if need be, the knife is reapplied where thorough removal is not assuredly apparent. The vessels having been secured, the wound is brought together, and treated in the ordinary way.

Tumors external to the mamma, forming in its immediate vicinity, but not incorporated with it, are not uncommon. The simple are removed, leaving the gland undisturbed. In the case of the avowedly malignant, the entire gland, as well as the tumor, is taken away. Of this class of tumors, not in, but near the mamma, the majority are simple and fibrous.

Affection of the Mammilla.

The *mammilla* of the male is liable to hypertrophy and to malignant disease. In the one case discussives are expedient, the other demands free and early ablation.

The *nipple of the female* is also liable to hypertrophy, and malignant disease. In the former case, no direct interference is required; in the other, there is safety in nothing short of summary removal, not only of the nipple itself, but of the mamma also. There is one case, however, in which it is unnecessary to sacrifice more than the former—when the nipple has been hypertrophied many years, and begins to degenerate in structure. Such degeneration usually commences in, and is at first limited to, the apex; and, in such a case, to cut at the root of the nipple is to cut in sound parts.

The *fissured and excoriated nipple* of the nurse is an affection as frequent as distressing. A bare enumeration of alleged cures would occupy much space. Suffice it here to say, that the same treatment is necessary as in inflamed and irritable sores, modified by regard to the uses of the part. During application of the child, the nipple is protected by a shield; and, in the interval, some of the many remedies are applied, which are not likely to injure the child, while at the same time they tend to soothe and heal the affected part.

Abernethy on Tumors, Lond. 1804. Cumin, a General View of Diseases of the Mamma, &c. Edin. Med. and Surg. Journal, vol. xxvii. art. 1, 1827. Cooper, Illustrations of Diseases of the Breast, Lond. 1829. Jeanselme, Mémoire sur les inflammations et les abcès du sein chez la femme, Gazette Médicale, Jan. 1839. C. Bell on Carcinoma Mammæ, Med.-Chir. Trans. vol. xii. p. 713. Brodie, Lectures on Pathology and Surgery, Lond. 1840. Birkett on Diseases of the Breast, Lond. 1850. Forget, Bulletin de Thérapeutique, tom. xxvii. p. 355. [Lébert, Maladies Cancéreuses; Walshe, Treatise on Cancer; A. Bérard, Diagnostique Différentiel des Tumeurs du Sein, Paris, 1842.—Ed.]

CHAPTER XXVII.

AFFECTIONS OF THE ABDOMEN.

Abscess of the Abdominal Parietes.

Abscess of the abdominal parietes sometimes occurs spontaneously; frequently, it is the result of external injury; and, in some systems, but a slight blow, or a strain, as in retching, may suffice. The site of the abscess is more frequently deep-seated than superficial. At first, there is a hard, tender, increasing tumor, which softens obscurely as it enlarges, and slowly points. Treatment varies according to the stage. At first, while the inflammatory process is but recent and slight, and the swelling consists of plastic exudation, resolution is in our power, by rest and antiphlogistics. Advancement of the tumor is arrested, and the hard swelling begins to disappear. This subsidence may be accelerated by judiciously used discussives; employed, however, always with the greatest caution, inasmuch as we know, by experience, that if they be used either too freely or too soon, there is here a great probability of inflammatory reaccession, in an aggravated form. So soon as the formation of matter has been at all indicated, a free evacuating incision should not, for an instant, be delayed; it being remembered that the pus is much nearer to the peritoneum than to the integument, and, moreover, bound down by strata of dense fibrous tissue. But it is surely advisable to go a step farther; and, whenever we feel convinced that reasonable hope of arrest and resolution is gone, make an incision in the most prominent part of the swelling, where we anticipate that matter is first and mainly to form, in order that, so soon as it does form, it may find a ready drain for its outward escape; all the hazards of its pent-up accumulation, in any quantity, being thereby felicitously avoided. If artificial opening be withheld, one of two events is very likely to occur; the pus, finding its way into the general cavity of the abdomen, excites a most hazardous peritonitis; or, on spontaneous evacuation taking place, the condition of fecal fistula is declared—the perforation internally, surrounded by plastic exudation, having penetrated into an adherent fold of intestine.

As already stated (p. 233), cherry stones, and such like substances, may be arrested in the vermiform process of the cæcum, and cause abscess of the abdominal parietes; so effecting their own escape.

Tumors of the Abdominal Parietes.

These demand, also, early attention, lest, by long continuance and enlargement, they become unfavorably connected with the deepest portion of the parietal layers. The adipose is, perhaps, more common than any other form of tumor in this situation. In dissecting it out, the preliminary incisions should penetrate quite into the substance of the fatty matter, thereby facilitating extraction, and avoiding unnecessary depth and extent of incision.

Bruise of the Abdomen.

This is always important, on account of risk of injury to the abdominal contents. Dangerous hemorrhage may at once occur by lesion of these, or formidable inflammatory action may be kindled subsequently. And, in treatment, both of these contingencies must be regarded. Absolute rest and quietude are enjoined, and the simplest ingesta are given most sparingly. Thus, extravasation of blood from a torn part is not favored; neither is escape of contents from any ruptured viscus promoted, on the contrary. On the first rising of the pulse beyond the limits of moderate reaction, on the accession of increased pain, with vomiting, or other sign of disorder of the system; in other words, so soon as there is any indication of inflammatory action having begun, the lancet is employed freely, and is followed by calomel and opium, as circumstances may demand. And here the opium may be administered in a larger proportion than usual (*Principles*, 3d Am. Ed. p. 170), it being the only available opponent of the intense and exhausting pain which attends on such action; and it besides being of good service, in injury of the intestines more especially, by exerting a sedative effect on the muscular coat of the bowels. Very obviously, purging is not to be dreamed of in the early treatment. Subsequently, when it is necessary to move the bowels, the gentlest remedies are to be selected, and even they are used with caution.

The first effect of bruise, attended with serious injury of the internal organs, is to produce a marked state of shock, or depression in the system. And a very common error in practice is, at once to attempt removal of this. The same evil consequences follow, as in the analogous case of injury done to the cranial contents (p. 39). Let the patient alone; and ere reaction occurs, with its quickened and full circulation, a torn liver or spleen may have had its vessels closed by nature's hemostatics, and a ruptured portion of intestine may be so circumstanced by position and exudation, as to render fatal escape of its contents into the peritoneal cavity at least less probable. But, stimulate unwisely, and then premature reaction is established; the returning blood finds the mouths of vessels still open, and intestinal extravasation is quite unopposed. In one case only are we to interfere; and that is, when the shock is extreme in both intensity and duration, and threatens to prove directly fatal. Then we stimulate, to save life from immediate loss;

and yet we stimulate very cautiously, lest, saving from one hazard, we engender another at least as great.

A remote consequence of abdominal bruise may be such atrophy of the muscles at the injured part as shall cause permanent weakness there, with consequent liability to hernial protrusion.[1]

Wounds of the Abdomen.

Wounds penetrating the abdominal parietes, and implicating the viscera within, are necessarily fraught with much danger. From lesion of the liver, a formidable hemorrhage can hardly fail to occur; wound of the urinary bladder causes infiltration of the contents, almost invariably fatal; from wound of the gall-bladder, acrid bile will escape, kindling intense peritonitis; both acrid extravasation and dangerous loss of blood are likely to follow wound of the kidneys; wounds of the spleen, like those of the liver, are dangerous mainly on account of the risk of hemorrhage; from injured intestines, fecal extravasation is likely to take place, causing an extent and amount of inflammatory action which is seldom if ever recovered from. Such severe injuries are invariably attended with a grave amount of shock, which serves the double purpose of warning the attendant of the importance of the case, and giving an opportunity for the completion of nature's measures for obviating hemorrhage and extravasation. This state, as formerly observed, is not to be rashly interfered with by the practitioner; its progress is watched; reaction is rather delayed than hastened; and when this, no longer repressible, advances to excess, antiphlogistics are employed actively.

Wound of the Bowel, suspected when discharge of blood by the mouth or by the anus accompanies the attendant shock, is not necessarily followed by extravasation. A mere puncture is closed by nature's efforts. The mucous coat is protruded outwards, and plugs the orifice; the abdominal viscera exert a constant equable pressure on each other at every point, and this tends obviously to counteract escape of contents; and these two temporary means of arrest are duly followed by another which is permanent, namely, exudation of plastic lymph on the exterior of the wound, whereby union of the opposed surfaces of peritoneum, and a safe circumvallation of the injured part, are effected. As in natural hemostatics (*Principles*, 3d Am. Ed. p. 336), the temporary means are by plug and pressure, the permanent by plastic exudation. A moment's consideration of the nature of this process will explain how mischievous must be the imprudent exhibition of stimuli, or indeed of ingesta of any kind, at the outset of the case.

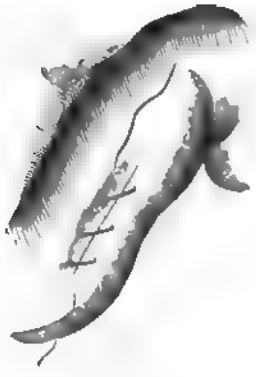
Protrusion of the Bowel.—If through a penetrating parietal wound a portion of intestine, or other viscus, protrudes entire, it is to be simply replaced, with all gentleness, so as not to endanger an aggravation of inflammatory accession; and yet with all accuracy, the finger following the retreating viscus closely, so as to insure its being replaced wholly within the abdominal cavity, and thus avoiding the serious risk

[1] Guthrie, Lancet, No. 1441, p. 397.

of obscure strangulation, which is so prone to follow partial reduction. The wound is carefully approximated, by suture, if need be, and by moderate bandaging such pressure is made without, as is calculated to prevent reprotrusion. In subsequent treatment an anxious prophylaxis is maintained, with a preparation for suitable antiphlogistics on the shortest notice.

If the protruded part be found to have sustained mere puncture, it may be simply replaced, as if intact, trusting to nature's means of closure. If a larger wound exist, incised, of no great extent, and consequently deemed capable of adhesion, it is to be brought accurately together by the glovers' suture (*Principles*, 3d Am. Ed. p. 602). And, in applying this, it is well to turn in the edges of the wounded part gently, so that the approximated surfaces shall be peritoneal, that structure being well known to be much more capable of the required plastic exudation than are the mucous or middle coats of the bowel. The punctures of the needle should not be more than a line apart, and the fingers of an assistant should accurately retain the inverted condition of the wound during the manipulation. It is well to take the first stitch from within outwards, and the placing of a large knot here is supposed to favor the inward escape of the thread, which in time ulcerates its way into the cavity of the bowel, and is thence discharged. The suture having been duly arranged, the part is gently replaced, in the hope that it may become safely covered up by plastic exudation.

Fig. 172.



The Glovers', or continued Suture, in wound of the Bowel.

If the portion of bowel be bruised, or otherwise so extensively injured as to render the occurrence of adhesion obviously impossible, it were folly to effect mechanical union and replacement of the part. After such procedure, the wound must necessarily inflame and open, feculent extravasation is inevitable, and death is almost certain. The wounded part should be retained at the surface, and, with this view, the peritoneal coat is united with the integument, at the lip of the wound, at one or more points by suture, and then through the upper orifice of the wounded part the feculent contents discharge themselves innocuously. The condition of *Artificial Anus* is established; a state of much discomfort, and not altogether devoid of danger, but infinitely preferable to fatal peritonitis by feculent escape within the cavity of the abdomen.

Thus, the local treatment differs according to the nature of each case. But in all, the constitutional treatment is the same; rest and quietude; starvation; free venesection or leeching, or both, on the first onset of overaction; then calomel and opium—the latter in large doses.

Artificial Anus.

By this term is meant an unnatural outward opening of the intestinal canal, whence fecal contents are more or less copiously discharged. It may be the result of wound, of abscess and ulceration, or of sloughing consequent on strangulated hernia. By plastic exudation, the open portion of bowel is retained in contact with the abdominal parietes; and the following condition of parts becomes established. The orifice of the upper or gastric portion remains abundantly patent, and not unfrequently, troublesome prolapsus of its lining membrane occurs; the orifice of the lower or rectal portion contracts, is not patulous, and recedes from the external surface; the two portions have a dense septum interposed between them—composed mainly of the two contiguous portions of the coats of the bowel; and this becomes more and more solid, and more and more opposed to restoration of the normal flow of the intestinal contents. Outwardly, the abdominal parietes are usually distended into a funnel-shaped cavity, whose apex is at the integument, whose base surrounds the intestinal breach, and within whose cavity feculent matter tends to accumulate. The integumental opening is red, everted, prominent, and surrounded by excoriation.

The dangers and difficulties of such cases depend very much on the site and extent of the intestinal opening. If this be large and near the upper part of the tube, death by inanition can scarcely fail to occur; chyle running so much to waste. If, on the contrary, the opening be in the large bowel, nutrition may be sufficiently maintained, and the result will probably be one more of annoyance than of danger.

Treatment is in the first instance palliative. Such food is taken as is easily digested; and the bowels, by diet, and medicine, if need be, are kept "soft and easy." By external support—by compress and bandage, or by the adaptation of a suitable truss—outward escape from the upper orifice is moderated, if not altogether prevented, and protrusion of the mucous membrane is opposed. And the ordinary means are employed to obviate excoriation of the surrounding integument. The outer opening may contract and heal, the funnel-shaped cavity may close, and the normal flow may be restored. But much more frequently such is not the case; and farther interference by our art is required. The two main obstacles to cure plainly are—projection of the septum, and retraction and contraction of the lower intestinal orifice. The latter state is to be opposed by the occasional introduction of tubes or tents, gradually enlarged, whereby the normal caliber may be restored. The septum is to be got rid of by the gradual process of ulceration. Dupuytren's forceps may be employed for this purpose; one blade passed into each orifice, the instrument closed and locked, and the degree of pressure regulated by the screw at the handle. The pressure is at first applied lightly and temporarily; lest overaction ensue, and the surrounding parts be implicated so as to establish either enteritis or peritonitis. And throughout the whole period of the instrument's use, the effects must be closely watched, lest at any time overaction threaten to occur. By thus gradually destroying the septum—inducing ulcera-

tion of it by pressure, and regulating that pressure so that the inflammatory process it creates shall not go beyond ulceration in the part, nor extend thence to the neighboring textures—by dilating and bringing forward the lower orifice, and by maintaining the external pressure at all times when the forceps and tent are not in use, we hope to restore the normal flow, and effect permanent closure of the aperture. But not only must this use of the forceps be cautiously conducted, it must also be warily begun. Weeks or even months should elapse before it is employed. For an early application is plainly in favor of the occurrence of the following risks; a fold of bowel interposed between the two orifices, on account of the septum not being yet fully developed, may be grasped by the instrument, and fatal enteritis may ensue; or the yet recent, tender, and imperfect adhesions of the bowel to the parietes may be broken up, the former may recede, feculent extravasation then takes place, and life is soon ended miserably by peritonitis; or, simply on account of the still unquiet parts having no tolerance of a newly excited action, immature use of the forceps may be speedily followed by enteritis; or the pressure may cause ulceration of an asthenic kind —not attended by plastic exudation around—the abdominal cavity may consequently become exposed, and feculent extravasation may occur therein.

The projecting septum, or *eperon*, may be repressed simply by the pressure of tents; or the ingenious, though somewhat complicated instrument of Mr. Trant,[1] may be used instead of that of Dupuytren. Such pressure, causing replacement and absorption of the projecting obstacle, is obviously more safe than that which produces destructive ulceration.

An artificial anus is sometimes established, designedly, by the surgeon, when the natural anus is imperforate; or when, from any cause, the rectum has become insuperably obstructed. These proceedings will be considered in connection with affections of the lower bowel.

Fecal Fistula.

When an artificial anus has contracted to a narrow sinus, with a papillary orifice through which intestinal contents occasionally escape, it is termed a Fecal Fistula.

A similar state may also result from parietal abscess (p. 367), whose cavity has opened, by ulceration, into a portion of adherent bowel, either before or after external evacuation. The opening of communication is usually small; the cavity of the abscess contracts; and the condition of fistula is soon established.

The methods of treatment are simple. Accurate and firm pressure is applied to the part, so as to prevent feculent escape, and favor consolidation of the entire track. This may succeed, after patient continuance for some time, along with due attention to the state of the bowels. If it fail, then the actual cautery may be applied, so as by contraction of the burn to obtain closure (*Principles*, 3d Am. Ed. p.

[1] Dublin Med. Press, vol. xiii. p. 305; and Brit. and For. Med.-Chir. Rev. Jan. 1847, p. 28.

220). And if this do not succeed, then, by autoplasty, the chasm may be filled up and permanently consolidated; a suitable portion of integument being transplanted from a neighboring part.

Pelvic Abscess.

The sub-peritoneal areolar tissue, in the pelvic region, is liable to be the seat of suppurative inflammatory action; sometimes in connection with the puerperal state, but often wholly independent of this. Occasionally it is induced, on the right side, by irritation extended from the caput cæcum, forming the *perityphlitis* of Burns and others; on the left side it may originate in impaction, or other disorder of the lower bowel. It has followed operative interference with the uterus, or its appendages, as well as with the penis and bladder, not unfrequently; sometimes it is traced by the patient to a chill; sometimes it can be connected with no assignable cause. The disease is more frequent in the female than in the male. Exudation may be both rapid and copious; and, at first, is either serous or lymphous. In this state it is amenable to absorption; and, under suitable treatment, may disappear rapidly. When suppuration has fairly taken place, evacuation is to be looked for, either spontaneously or by the hand of the surgeon. In the former case the point of exit varies; at the hypogastrium, by pointing in the ordinary way; in the groin, by the bowel, through the vagina, into the bladder; or into the general abdominal cavity. Fortunately, the last-mentioned casualty is comparatively rare; the peritoneum, from its fibrous nature, long resisting the ulcerative action of the accumulating pus (*Principles*, 3d Am. Ed. p. 204). Sometimes, instead of suppurating, the tissue becomes loaded with a dense plasma, partially incorporated and organized.

The symptoms are often ushered in by rigor. There are pain and tenderness of the part, with dulness on percussion. The rectum and bladder, being compressed, and involved in sympathy, have their functions more or less disturbed; and the uterus, too, is liable to displacement. On examining by the vagina or rectum, a hard dense swelling is perceived; determined to be non-uterine, if need be, by the use of the probe; and, unlike other pelvic tumors, having very firm connection and continuity with the bony walls of the pelvis. In doubt, an exploratory thrust may be made by the small trocar, through the abdominal parietes, by the vagina, or by the rectum, according as the site of the swelling may determine. On outward pointing taking place, the nature of the case becomes abundantly plain.

At an early period, the treatment consists of leeching, followed by counter-irritation, and mercury pushed to ptyalism. Iodine may be painted over the abdominal parietes; or it may be administered in the form of ointment, by the vagina. Under such treatment, with rest, and attention to the general health, many formidable effusions satisfactorily disappear; perhaps leading an inexperienced observer to suppose that an ovarian or other tumor has been discussed. When matter has formed, it should be early evacuated, by means of the bistoury or trocar, at the point which circumstances may indicate as most suitable; by the vagina, by the rectum, or through the abdominal walls.

Retro-uterine Sanguineous Tumors.

There is another class of swellings in this situation, which may be mistaken for the inflammatory pelvic tumor, in the female. They are caused by extravasation of blood into the sub-peritoneal areolar tissue of the *cul-de-sac* between the uterus and rectum; and in their pathology resemble the thrombus, which is not unfrequently found situated in the vagina or vulva. The affection may, in fact, be described as a thrombus of the roof of the vagina. Attention has been recently directed to this subject by some late discussions in the Surgical Society of Paris; and Dr. Montgomery, of Dublin, has published cases of thrombus in this situation, occurring during or after labor.

The blood is infiltrated into the areolar tissue, around the cervix uteri, and may spread thence into the areolar tissue surrounding the rectum, or into that involved between the folds of the broad ligaments. These tumors are liable to occur chiefly in cases where there is much venous congestion, and especially if there is a varicose and diseased condition of the vessels. They are caused by powerful straining efforts, as in labor, venereal excesses, &c. They may also, as M. Huguier points out, be produced by the escape of blood from a uterus over-distended by retained menstrual secretion.

On examination, the roof of the vagina will present a hard resisting surface, without pain on pressure; or, if recent, tender to the touch in a much less degree than the real inflammatory pelvic tumor. The uterus will be found generally somewhat elevated, and pressed to the pubes.

If they are small, these tumors require no special treatment. Rest in the recumbent position, and the antiphlogistic regimen, are necessary as precautionary measures. If the extravasation is very extensive, there will be constitutional disturbance; and local excitement may be produced, perhaps terminating in true inflammation. In this case, treatment must be conducted as in the common inflammatory pelvic tumor.

Ovarian Dropsy and Tumors.

Of abdominal tumors, the ovarian are those which most attract the attention of the surgeon. Occasionally fibrous tumors, or masses of the different forms of the ordinary malignant tumor, are found affecting the ovary, either alone or in combination with the cystic disease of the organ —which latter very far surpasses all others in the frequency of its occurrence, and is generally known as *ovarian dropsy*. These cystic tumors are multilocular more frequently than monolocular. They may occur only on one side, or on both at the same time; they may be attached by a narrow pedicle to the broad ligament, or by a broad base; they may be movable, or fixed in the cavity of the abdomen—this generally depending on their size, which varies extremely; they may be free, or more or less adherent to the surrounding organs, or connected with the abdominal walls. On dissection, the ovary of the affected side may be undiscoverable; or it may be either entire, or partly incorporated

with the tumor. The disease is believed by numerous pathologists always to originate in the Graafian vesicles; and there is good reason to attribute certain of these productions to this source; but it is equally well ascertained that the multilocular formation does not always acknowledge such an origin.

The disease may affect a woman at any time of her menstrual life, and is found occurring most frequently at that period when the reproductive functions are in greatest activity—namely, between the ages of twenty and forty. It attacks the virgin as well as the married woman. Of course, it is found more frequently in married than in unmarried women, but there is no evidence for a common statement of authors that the former are more liable to it than the latter.

Many causes connected with menstruation, marriage, and parturition, have been assigned to ovarian dropsy, but this part of the history of the disease is necessarily very difficult of investigation. These affections may be mere precedents, and not causes.

The disease may attain a large development, without giving rise to any symptoms except such as are referable to the displacements effected by its bulk. It may be accompanied by irregularity of the menstrual function, by menorrhagia, or by amenorrhœa. At its commencement there may be much complaint of pain and tenderness in either side, or a deep-seated pelvic pain may exist, or there may be other modifications of pain and tenderness too varied to demand description. The tumor may press on the sacral nerves, and cause numbness and a feeling of powerlessness in one limb; or venous congestion and œdema of it, by obstructing the circulation. There may be pain and difficulty in defecation. Piles, and a varicose state of the veins of the legs, are often found. In diagnosis, our reliance must be placed almost entirely on the physical signs. Much obscurity is often produced by distension of the abdomen, with flatulence, when the disease is in an early stage; and the evidence of its nature is derived chiefly from the circumstances of its position, its mobility, or its connections. At a later period, when it is distending the abdominal walls, we trust to its own physical characters, the nature of its contents, and the history of its origin and progress.

Careful manipulation usually shows the swelling not to be so uniform or soft as in ascites, but more or less broken up in its outline, as well as of various hardness. Attention is also given to the following points: In ascites, the fluid always occupies the most dependent parts, while the small intestines, floated by their contained air, correspond generally to the umbilical region; and the arch of the colon and the stomach occupy the epigastrium. Percussion, therefore, elicits a dull sound over the hypogastric and lumbar regions, and a clear one in the umbilical and gastric; whereas, in a large encysted dropsy, no tympanitic sound exists in these regions. The intestines, pushed back by the cyst which is developed anteriorly, may, however, produce a resonance laterally and posteriorly. Fluctuation is generally more easily and distinctly detected in ascites. If the ovarian fluid is of great viscidity, or if the anterior cysts of the mass are numerous and small, fluctuation may be scarcely perceptible; while, on the other hand, if the disease be monolocular, fluc-

tuation may be very apparent. Sometimes, in the multilocular variety, the larger cysts can be made out separately by the facility and distinctness of the fluctuation, when both hands are over the same cyst; and by its indistinctness or absence when one hand is on one cyst, and the other on a different one. In encysted dropsy, the general health is often comparatively undisturbed, while in ascites the reverse is almost always found to be the case. Along with ascites, there is generally anasarca of the lower extremities, while in ovarian dropsy this is rarely observed. In the latter affection, however, we frequently find a varicose state of the vessels, and puffiness of the limbs. It is also to be remembered that ascites and ovarian disease frequently coexist; the ascitic fluid being of the ordinary kind; or, as has been observed by Dr. Bennett and others, derived from an ovarian cyst by passing through foramina in its walls. When these diseases coexist, fluctuation, if light and superficial, may deceive; but if the fingers are pressed more deeply, a peculiar diagnostic mark is obtained by the stroke of the fingers against the ovarian cyst—after displacing the overlying ascitic effusion. If there is still doubt, we may in some cases be justified in drawing off a few drops of the fluid by a small trocar, and ascertaining its nature by proper tests.

Dulness on percussion over the hypogastric region is more decided in ovarian dropsy than in ascites. If, however, the pedicle be long, and the tumor only moderately large, and not distending the abdominal walls, but rather floating in the cavity, there may be some resonance above the pubes. In some rare cases this mark is of importance, in distinguishing the ovarian dropsy from pregnancy; in both cases we may find, on auscultation, a murmur resembling the placental *souffle*; and in ovarian disease, especially if recent, the equivocal signs of pregnancy may be present. From pregnancy it is farther distinguished by absence of the fœtal heart's pulsation, by the absence of ballottement,[1] by the drawing up of the uterus and vagina, so that the cervix is with difficulty reached, by the hardness and length of the cervix, by the anteverted or retroverted state of the organ, by the commencement of the disease on one side, by more or less complete absence of the ordinary constitutional signs of the pregnant state, and by the duration and history of the complaint. Let the surgeon, however, never forget that with ovarian disease (at least of one side) there may coexist an impregnated womb.

There is, occasionally, great difficulty in distinguishing a multilocular ovarian dropsy from fibrous or other tumor of the uterus. The tension of the cysts, their small size, and the viscidity of their contents, may be such as to destroy all signs of fluidity in the ovarian mass; and the uterus may be so fixed in the pelvis by compression between it and the tumor, or by adhesions, as to render the signs derivable from a vaginal examination also nugatory. The history of ovariotomy, too, truly shows that the diseases may be mistaken for one another by the most experienced and able physicians. The chief distinctive marks are the follow-

[1] A modified ballottement may be discovered in a case of ovarian tumor, if it is of moderate size and floating in ascitic fluid.

ing: A fibrous tumor is often observed first in the centre of the hypogastrium, an ovarian tumor generally at one side; a fibrous tumor grows more slowly than an ovarian; it has no fluctuation, and is generally much less movable and harder than a diseased ovary; it is more frequently accompanied by menorrhagia and leucorrhœa; the uterus is generally somewhat prolapsed, especially if the tumor is not of great size; the uterus feels heavy, and cannot be moved without moving the tumor; the cavity of the uterus is also often elongated; sometimes it is shortened; frequently, the shape and plurality of the tumors are distinctive.

In illustration and proof of the great difficulties which attend the diagnosis of ovarian disease, and of the errors liable to be made, even when the growth is so developed as to appear to demand an operation, we may cite the following fact in regard to one hundred and sixty-two cases in which incision of the ovary was attempted. In sixty of these, there was either no ovarian disease at all, or its removal was found impracticable.[1]

The management of ovarian dropsy is either palliative or radical. Besides, the ordinary treatment for intercurrent attacks of inflammation, derangements of the functions of the stomach, bowels, kidneys, and bladder, the most important palliative measures are tapping and pressure. Recourse to the former has been recommended early in this affection; but it is a very questionable proceeding, and one, besides, which we rarely have an opportunity of trying, as women seldom complain till the disease is far advanced.

Tapping is not advisable, except under rare circumstances, till the accumulation has become intolerable to the patient, from its large size impeding respiration and progression, and causing much local pain and suffering; perhaps producing vomiting, or suppression of urine, by pressure on the stomach or kidneys. It is a very simple operation, and the danger supposed to attend it in ordinary cases, has probably been exaggerated in the statistical tables of Southam, Safford Lee, Atlee, and others; which, embracing all cases, do, no doubt, include many in which it was resorted to in despair, or as a mere palliative, the patient's strength being already worn out by the disease, or compromised by some other affection. The dangers chiefly to be apprehended are syncope, the lighting up of suppurative inflammation in the lining of the cyst or cysts, and the supervention of peritonitis.

It is performed thus: The patient having been seated on the side of a bed, or on a chair, has the abdomen tightly girded by a sheet or flannel bandage; the ends of which are held by two assistants, directed to pull steadily and firmly as the fluid escapes—so as to maintain equable pressure on the abdominal contents, and obviate the sudden loss of support to these, which might otherwise occur, and from which serious hemorrhage might ensue by the giving way of one or more abdominal veins suddenly deprived of their ordinary support. Or, independently of rupture, alarming syncope might take place, from great or sudden accumulation of blood within the abdominal veins. It

[1] Lancet, Dec. 6, 1851.

is well to ascertain that the bladder is empty. An aperture having been made in the bandage, an incision is made through the skin and fascia by a lancet or scalpel; and then perforation is completed by a large trocar and canula. The trocar having been withdrawn, the canula remains, and through this the fluid escapes; thin and albuminous, or viscid, ropy, and variously discolored. Fluid having ceased to come, the canula is withdrawn, the wound is covered by a compress, and the general bandage of the abdomen is drawn tightly and secured. This cure by tapping is an excellent instance of the surgeon taking a lesson from the plans sometimes adopted spontaneously by Nature. Examples of the simple cyst, and more rarely of the multilocular, have been cured by spontaneous discharge of the contained fluid from openings through the umbilicus, or some other part of the abdominal wall, or by discharge of the fluid per vaginam or per rectum.

The point usually selected for the opening is in the linea alba, about midway between the umbilicus and symphysis pubis. But it may be made in the linea semilunaris, if the bulging of the ovarian cyst render that locality preferable.

By the use of pressure after tapping, the walls of the cyst are made to collapse, and the mass comes to form a comparatively small firm tumor in one side of the pelvis. When such pressure is resorted to, it should be kept up for some months; as these tumors have been known to refill, after they have lain in the pelvic cavity for a long time collapsed and causing no inconvenience. The use of pressure, if it can be borne, and be regularly conducted, is decidedly of service in impeding growth of the tumor, and refilling of the sac after tapping. Some very interesting cases are recorded, where inflammatory action, attacking the cyst, and its serous investment, has induced such induration, and caused the formation of adhesions so strong, as to resist farther progress of the tumor; curing the disease by mechanically arresting its progress. But the cysto-sarcomatous tumors, the fibrous, and the malignant masses, which are not unfrequently found in this situation, either alone or along with the multilocular cyst, are, of course, not amenable to any method of discussion.

As auxiliaries to tapping and pressure, the only remedies to be recommended are iodine and diuretics. The former may be used both externally and internally. That they may be of some service, we have evidence in the fact occasionally observed, that the rapidity of the growth or refilling of an ovarian tumor keeps pace with the diminution of the urinary secretion. The remarkable increase of this secretion often observed for some days after tapping, is sometimes accompanied by progressive diminution of the tumor, which recommences to fill only when the urine again diminishes.[1] In general, after tapping, the cyst speedily refills and the operation is repeated as before, the cyst usually filling more rapidly after every repetition of the operation. The second tapping may not be required till after several months; but subsequently

[1] Many authors of note entirely discredit the efficacy of all internal remedies. Burns says they have an equal effect "over the configuration of the patient's nose." Hamilton, as is well known, used the solution of muriate of lime internally as a discutient, and placed great confidence in it.

the interval may diminish to a few weeks. This process generally exhausts the patient after some years, or an intercurrent attack of inflammation in the cyst, or in the peritoneum, may prove speedily fatal. Sometimes, however, patients survive to have the tapping very often repeated, and almost incredible quantities of fluid have thus been drawn off from the same woman.[1]

These tumors may be dealt with heroically. Attempts may be made at extirpation. The operation is very simple. The patient having been suitably arranged in a room of elevated temperature, a wound is made through the parietes of such an extent as may be necessary. There is no good reason for incising the whole abdomen in all cases, from the ensiform cartilage to the symphysis pubis. The external incision should be proportioned to the bulk of the tumor.

The dissection is to be carefully conducted till the tumor be brought into view, attention being directed to arrest as far as possible all bleeding from the wound. The tumor, its state as to adhesions, and its pedicle, are now to be examined; and, if deemed advisable, the operation is continued. Unless the adhesions are very strong and extensive, they do not form an insuperable obstacle. The tumor is to be turned out of the abdomen; the pedicle is tied, and then divided. The wound and the surrounding viscera are sponged clean, and the wound closed. If unfortunately the bowels cannot be kept within the abdomen during the operation, means must be taken to maintain in them their natural heat till they are replaced; they may be immersed in water at blood heat, or in fine linen moistened with tepid water. The ligature of the pedicle is brought out at the lowest part of the incision; and, last of all, the wound is closed by the interrupted suture, in such a manner as to expose as little as possible to the surface of the bowels beneath. This is effected by passing the needle close to the peritoneal surface of the wound. The interrupted quilled suture may sometimes be of service.

In conducting the first step of the operation, the plan proposed by Dr. Frederick Bird, to avoid mischances, may be resorted to, namely, to make at first only a small wound into the peritoneum, and to explore the tumor with the finger and probe; so ascertaining, to some extent at least, the feasibility of completing the operation before the patient is compromised by farther proceedings. At present, great hostility to all such operations is declared by a large body of the profession. There are cases, however, which may certainly render a duly conducted attempt quite warrantable; when the tumor is non-malignant, single, movable, and connected with a narrow pedicle; when the patient is

[1] Dr. Mead's patient, whose endurance is celebrated in the following epitaph, has now unfortunately been frequently surpassed.

"Here lies Dame Mary Page,
Relict of Sir Gregory Page, Bart.,
Who departed this life March 21st, 1728,
In the 56th year of her age.

In 67 months she was tapped 66 times,
Had taken away 240 gallons of water,
Without ever repining at her case,
Or even fearing the operation."

Dr. Martineau, of Norwich, tapped a patient 80 different times, and drew off 6832 pints of fluid.

apparently free from other disease; when the effects of this tumor are such as to threaten death by exhaustion at no distant period, unless relief be obtained; when the ordinary palliative treatment, after due persistence, has failed to give relief; and when the patient, having been made fully aware of the risk, is resolved and wishful to undergo the operation. Modern experience has certainly demonstrated, that free incision of the abdomen, with exposure and manipulation of the peritoneum, is a less hazardous procedure than was generally supposed. But there are extreme dangers necessarily attendant upon this operation, from its site and its nature, from the necessity of leaving in the wound a long cord attached to the pedicle, from the danger of the ligatures bursting, or the wound in the parietes partially opening, in consequence of distension of the bowels or efforts in coughing, and from the risk of strangulation of the bowel either in the wound or by the puckering of deep cicatrices. And, besides, the following unavoidable difficulties at present stand in the way of a general recommendation of the operation, namely, the confessed difficulty of diagnosis, as to the existence of extensive adhesions, as to the presence of malignant disease in the tumor or in the pedicle, and as to the large size of the pedicle rendering deligation difficult.

Sometimes cure is attempted by a minor proceeding, making an opening in the abdominal parietes, only a few inches in length, puncturing the cyst, and drawing it out as the contents escape, and then cutting off the attachment, after deligation. Such an operation, however, has not been found more successful than the more direct and open procedure, and certainly it is not more easy of performance. The danger of some fluid from the cyst escaping, and finding its way into the peritoneal cavity, the impossibility of cleaning out the wound with the necessary care, the imperfect deligation of the pedicle, &c., are obvious objections to this mode of treatment.

The statistics of ovarian operation give a mortality of about one death in every three cases. Its dangers, then, are very great. On the other hand, hopes of relief from ordinary treatment of the tumor cannot be sanguine. Most women are carried off by the disease in less than four years. Very few have the good fortune to be cured, and only a small number live beyond the four years. But it will always be a difficult and anxious matter for the surgeon to propose that a woman, suffering, it may be, very little from this disease, should subject herself to the risk of almost immediate death, in order to obtain the chance of getting rid of that which might possibly permit several years of comfortable existence.

The general treatment of ovarian disease is still an open question, and we entertain strong and confident hope that the great attention drawn towards it will, some day, attain to the discovery of a method of cure, or of a plan of palliation tantamount to cure. But we do not purpose to mention here any of the numerous methods now proposed for these objects. As yet, they have mostly proved even more fatal than ovariotomy, and have many additional objections. None have received the sanction of the profession.

Fibrous Tumors of the Uterus

May be found in any part of the organ. They may be single, but more frequently there are several present together. They may vary in size from a pea to a man's head. They rarely occur before the age of twenty, and are most frequently observed about the age of forty.[1] They do not prevent conception, but cause great risk of abortion during pregnancy, and in delivery may obstruct the advance of the child, also favoring hemorrhage and subsequent inflammation. The tumors themselves are liable to congestion, inflammation, and suppuration; in course of time, they may become calcified in whole or in part, forming the uterine calculi of old authors. They may be developed in any part of the uterine wall; the nearer to the mucous membrane, the greater is the hypertrophy of the uterine tissue. When the tumor is situated near to the peritoneal or to the mucous surface of the uterus, it may be protruded from the wall of the organ in a polypoid form, and, the pedicle gradually diminishing in size, the tumor may drop off into the peritoneal cavity in the one case, and in the other may be expelled per vaginam. When the tumor is near to the mucous surface, it is sometimes spontaneously discharged in another way, as has been observed to occur even in large tumors; and not unfrequently this result has followed the irritation and pressure caused by the efforts of delivery, on the tissues interposed between the cavity of the uterus and the tumor. By ulceration or sloughing, an opening is formed in these textures, and the substance of the tumor is exposed, disorganization ensues in the loose areolar tissue connecting the tumor to the uterus, contractions of the hypertrophied uterine tissue supervene, and expulsion of the tumor, in mass, or more gradually in parts, is the fortunate result. This may be called spontaneous enucleation, a process which has been imitated by art in some cases. If the tumor becomes polypoid, dilating the cervix or lying in the vagina, it may be treated as an ordinary uterine polypus. But it is to be remarked that more danger of uterine phlebitis attends the removal of this form of tumor, than of the ordinary uterine polypus.

The symptoms attending the presence of these tumors are neither constant nor diagnostic. Physical examination alone can detect their presence and decide upon their nature (p. 376). They are generally accompanied by feelings of weight, pain, or uneasiness in the hypogastrium, and pain in the back, in the side, or in the thighs—disorder of the functions of urination and defecation, &c.; but sometimes no symptoms at all exist. Often, there is an increased amount of vaginal secretion and discharge, which may be checked by a mild astringent injection. Menorrhagia not unfrequently occurs, and may require the ordinary treatment, if severe; it is generally a sign of proximity of the tumor to the mucous membrane. Occasionally, but rarely, there is amenorrhœa. If the tumors become congested and inflamed, ordinary

[1] Bayle states that in women above thirty-five years of age, fibrous tumors are found in one out of every five.

antiphlogistic treatment is necessary—especial attention being paid to maintenance of the recumbent position. If the tumors are large, prominent, heavy, or movable, an abdominal bandage or binder may be useful to support and fix them, and to afford the patient a feeling of security.

Nothing can be done in the way of discussing these growths. Discutient remedies, as iodine used externally and internally, counter-irritants, rest, the occasional local abstraction of small quantities of blood by leeching or cupping, have often a beneficial effect in removing disagreeable symptoms, and sometimes seem to arrest growth, or even cause a diminution in size—probably by removing the surrounding swelling and engorgement.

Gastrostomy.[1]

In the case of insuperable obstruction of the pharynx, œsophagus, or cardia, it has been proposed to open the stomach by direct incision; attaching the edges of the opening in the stomach to the integumental wound; and thus constituting a permanent aperture, for the introduction of food, similar to what occurred accidentally in Alexis St. Martin. The operation is feasible in theory, and simple in performance. But its extension to cases of hopeless malignant disease seems scarcely expedient.[2]

Gastrotomy.

When the bowels are obstructed from an internal cause, beyond reach from the outlet, a question arises as to the expediency of performing gastrotomy, with a hope of relieving the obstruction. If that depend on bands of lymph, or on intussusception, a simple manipulation might suffice to liberate the affected part. But the difficulty of diagnosis, and chance of failure, besides the danger of the operation, conspire to enforce great caution in resolving on such serious procedure. At the same time, when all ordinary means have failed, when several days have elapsed, and when the case is otherwise certainly hopeless, the doubtful chance of the operation may be afforded; more especially when pain, and other symptoms, point somewhat plainly to some part of the abdomen as the probable site of obstruction. At that part the incisions are made; with the precautions already spoken of. It may be happily in our power simply to disentangle and relieve; or, at the worst, the distended bowel may be evacuated by puncture, and an attempt made at establishing the condition of artificial anus. Of twenty-seven patients operated on, Mr. Phillips mentions thirteen whose lives have been preserved.[3]

[Mr. Phillips's paper, alluded to by Professor Miller, contains many very judicious observations, some of which may properly be quoted here.

[1] From γαστηρ, stomach; and στομα, mouth.

[2] Sédillot, Gazette Médicale de Paris, Jan. 1847; and Monthly Journal, April, 1848: Retrospect, p. 68.

[3] Phillips, Med.-Chir. Transact. vol. xxxi. Lond. 1848; also Brit. and For. Rev. April, 1849, p. 433.

His memoir is based upon the records, more or less complete, of 169 cases of obstruction of the bowels; from this number, those which depended upon disease of the cæcal appendix are excluded. Of the 169 cases, 63 were instances of invagination; 16 were caused by the pressure of tumors from without; 19 by stricture from disease of the parietes; 11 by intra-intestinal tumors—hardened feces or concretions; 60 by constriction from bands, from adhesion, from the passage of the intestine through some abnormal opening, or from a twisting of the intestine upon itself.

Mr. Phillips presents a sufficiently detailed account of the symptoms and *post-mortem* appearances, exhibited in nine authenticated cases of obstruction, depending upon as many different causes; these were ileus, the presence of a biliary calculus, the accumulation of fecal matter, an intra-intestinal tumor, malignant contraction of the colon, a malignant tumor pressing upon the colon from without, invagination, constriction by bands, and the passage of the intestine through an abnormal opening in the mesentery.

From a careful study of the symptoms presented in these cases and in the others, Mr. Phillips remarks that, "no matter what may be the cause of the obstruction, no certain remarkable difference is observed in the more prominent symptoms by which it is accompanied. There are in all abdominal pain, abdominal tension, obstinate constipation, and sickness; but in the mode of their occurrence it would be difficult to point out any distinct difference. Thus, constipation, abdominal pain, or uneasiness, with tension and sickness of the stomach, are present in greater or less intensity, in most cases; but there is no certain and definite line to be drawn, either as to the time at which they occur, or the severity with which they are ushered in, whether the obstacle be a biliary calculus, or a band of false membrane."—P. 15.

The diagnosis of the *seat* of the obstruction is not much more certain or satisfactory. With many exceptions, vomiting and pain are more severe when the obstruction occurs in the small than in the large intestines; and with the same qualification, if the urine be copious, the obstacle must be far from the stomach. So, too, valuable but not positive information may be gained from examining the abdomen, if this be done before much general abdominal distension has occurred, in order that the commencement and course of the flatulent dilatation may be ascertained. The introduction of the stomach tube, together with the injection of fluid, will frequently much facilitate the recognition of the site of the obstruction; it must be remembered, however, that the surgeon may be led into error by the bending of the tube, which is not at all unusual. Mr. Phillips's conclusion with reference to this point is, that "the history of the case; the particular seat of pain; the occasional existence of a tumor, which is now and then detected in cases of invagination, and indeed in some other cases, before there is much abdominal tension; the distended convolutions; the long tube, and the injection will usually afford us most important assistance in coming to a conclusion as to the seat of the obstruction. At the same time, it is certain that, in the experience of the ablest men, they have failed."—P. 18.

As to the success of *treatment*, it is not more satisfactory than the

diagnosis. Of the 169 cases which were subjected to the various modes of treatment, 133 terminated fatally, or rather more than seven-ninths. —P. 19.

With reference to the history of *Surgical Operations*, practised for the relief of obstruction, Mr. Phillips cites 53 cases; of these, 26 were performed upon infants for the purpose of establishing an artificial anus, the natural passage being imperforate; 27 were upon adults, for various kinds of obstructions.

Of the first 26 cases—the incision in each patient having been made in the left iliac fossa, or in the left lumbar region, and an artificial anus established—8 were successful; 12 died within a month; and in 6 the result was doubtful, the history being defective.

Of the second group of adult cases, 27 in all, an artificial anus was made in 19, for the relief of obstruction in or near the rectum. In 17 of these, an incision was made, either in the left iliac fossa, or the left lumbar region; and in two instances, the opening was made in the right iliac fossa. Of these operations nine were successful. In the remaining eight cases the operation was performed at other points of the abdomen, and without the establishment of artificial anus; and of these four appear to have been successful.—P. 30. At p. 34, Mr. Phillips says: "There are not more than two well-authenticated cases in which constricting bands have been severed; and with the exception of cases of invagination, not more than two cases in which the integrity of the intestine has been respected, and the obstacle successfully removed. From these sentences we infer that, in two of the four successful cases, without the formation of an artificial anus, the obstruction was owing to bands of false membrane, and in the remaining two to invagination.

The inferences which Mr. Phillips deduces from his scrutiny of the cases, with reference to the proper time for the operation, the point to be selected for it, &c., are as follows:—

"That the interference by surgical operation is justifiable when three or four days have passed without any relief from ordinary means (provided the constipation be complete, and vomiting of fecal matter continue), because it affords a greater chance for the preservation of life than ordinary means.

"That, if the indications as to the seat of the obstruction be sufficient to satisfy the surgeon, it is at or near that point that the incision should be made; but if there be much doubt, it is most prudent to make the incision on the median line.

"That if it be found impracticable to remove the cause of the obstruction, or imprudent to make any extended search for it, relief may be obtained by forming an artificial anus as near as may be prudent to the seat of the obstruction; and that, if it be, as it frequently is, near the termination of the ilium, an incision on the median line admits of its accomplishment as near as may be to the termination of that intestine."—P. 35.—Ed.]

Affections of the Diaphragm.

Surgically, the diaphragm may be affected by *penetratiny wound.* This may prove formidable by hemorrhage, or by inflammatory action, and has to be treated accordingly (p. 369); or, those dangers avoided, an imperfect closure or weak cicatrix may invite protrusion of the abdominal contents at the weak points,[1] more especially when that happens to be on the left side; and this may be followed by a sudden crisis induced by strangulation of a diaphragmatic hernia; or, from simple misplacement, the thoracic organs may suffer chronic disorder, not without a risk of ultimate asphyxia.

Rupture of the diaphragm may be produced by external injury or violent muscular effort. The risks by consequent misplacement of the abdominal organs are as in the former case. Such malposition is usually indicated by an anxious expression of countenance, a sunk empty state of the abdomen, corresponding fulness in the chest, thoracic percussion unusually clear or unusually dull, auscultation affording borborygmi rather than respiratory murmur, with obscuration of the sounds of the heart. In treatment, but little is in our power.

Should *paralysis* of the diaphragm coexist with ascites, obviously great care is specially necessary in withdrawing the fluid by paracentesis, lest dangerous collapse occur (p. 377).[2]

Travers, Inquiry into the Process of Nature in Repairing Injuries of the Intestines, &c. Lond. 1812. Scarpa, on Hernia, by Wishart, Edin. 1814. Lizars, Observations on Extraction of Diseased Ovaries, Edin. 1825. Fingerhuth, Dissertatio de Vulnerum in Intestinis Sutura, Bonn, 1827. Weber, de Curandis Intestinorum Vulneribus. Reybard, Mémoires sur le Traitement des Anus Artificiels, &c. Paris, 1827. Jobert, Traité des Maladies Chirurgicales du Canal Intestinal, Paris, 1829. Velpeau, Mémoire sur l'Anus Contre Nature, &c. Paris, 1836. Dupuytren, de l'Anus Contre Nature, &c. Leçons Orales, &c. vol. ii. p. 193. Lawrence on Ruptures, Lond. 1838. Teale, Cyclop. of Practical Surgery, article *Intestinal Fistula*, Lond. 1841. Phillips, Med.-Chir. Trans. vol. xxxi. Clay, Cases of Peritoneal Section for the Extirpation of Diseased Ovaria, &c. Medical Times, vol. vii. pp. 43, 59, 67, 83, 99, 139, 153, 270. Phillips, Med.-Chir. Trans. vol. xxvii. p. 473, 1844. Lee, on Tumors of the Uterus and its Appendages, Lond. 1847. Bright, Guy's Hospital Reports. Boivin and Duges, Diseases of the Uterus, &c. Cruveilhier, Anat. Pathol. livrais, 5, &c. Seymour, on Diseases of the Ovaria. Nauche, Malad. Propr. aux Femmes. Lee, Cyclop. of Pract. Medic. art. *Diseases of the Ovary.* Simpson, Library of Medicine, vol. iv. [See Lee, Medico-Chir. Trans. 1851; and Atlee, Transact. Am. Med. Assoc. vol. iv. for very full tables, with reference to the ovarian operation.—Ed.]

---

[1] Mr. Guthrie is of opinion that a wound made in the diaphragm never heals by closing.

[2] Von C. W. Mehliss, die Krankheiten der Zwerchfells des Menschen, Eisleben, 1845; also British and Foreign Med. Rev. July, 1847, p. 166.

CHAPTER XXVIII.

HERNIA.

By Hernia is understood a protrusion from within an internal cavity, of part of the contents of that cavity. But the term is usually limited to the most frequent form of such protrusion, namely, that from the cavity of the abdomen. And of this Hernia there are varieties, according to the site of the protrusion: Inguinal and Ventro-inguinal, Femoral, Umbilical, Ventral, Phrenic, Perineal, Vaginal, Labial, Obturatorial, Ischiatic. These, again, may vary according to the anatomical relation of their parts: Congenital, Infantile; and according to the parts protruded: Enterocele, Epiplocele, Entero-epiplocele, Hernia Litrica. And, farther, other varieties depend on the pathological condition of parts: Reducible, Irreducible, Incarcerated, Strangulated.

The *Causes* of Hernia are predisposing and exciting. Whatever weakens the abdominal parietes at any point, predisposes to protrusion at that point; natural want of closeness of development, as at the groin and navel; rupture of muscle and fascia, at any part, as in parturition; atrophy of muscle, following bruise; penetrating wound. Again, whatever tends to propel the abdominal contents with unusual force against such weakened or predisposed parts, directly excites or causes the protrusion; as violent coughing, straining at stool, or severe muscular exertion of any kind. And, farther, the predisposing and exciting cause may be the same. Cough, straining, or habitual exertion of the abdominal muscles in any way, when long-continued, tend to weaken and enlarge the natural outlets of the cavity, by constantly propelling the abdominal contents against the parietes—and thus prove predisposing. And then some sudden cough or strain effects protrusion, and proves the exciting cause. Hence it is, that old men with coughs and urinary complaints, sailors, gymnasts, &c., are especially subject to the ordinary forms of this disease.

The *component parts* of the tumor vary according to the nature of the protrusion. But, generally, they may be stated to consist of Coverings, Sac, and Contents.

The *Coverings* are far from uniform; differing in the varieties of Hernia, and being seldom exactly the same in any two cases. In inguinal and femoral hernia, for example, the coverings differ widely; and in each of these affections, the density, thickness, and even number of the investing layers, depend very much on accidental circumstances. In operating, it is vain to look for an unvarying sameness in this part of the tumor. In all cases of ordinary hernia, however, there is first

the usual integument, and then one or more layers of fascia. These will be enumerated, in the separate consideration of the varieties of hernia.

The *sac* is the portion of parietal peritoneum which is pushed before the protruding viscus, and which forms its immediate envelop. Sometimes it is wanting, as in hernia following directly upon wound, and in the congenital form of the disease. In the great majority of cases, we are to count upon its presence, adherent or not to the extra-abdominal parts with which it is in abnormal contact, according to the duration of its presence there, and the occurrence or not of plastic exudation on its exterior. We ordinarily speak of the neck and body of the sac as we do of the neck and body of the general tumor; the neck being that portion, of smaller caliber, which is at and near the aperture of protrusion, and the body being understood to be the more globular swelling beyond. If the tumor have been long protruded, without reduction, and otherwise but little altered in its circumstances, the neck of the sac is apt to become dense and unyielding in structure, and the caliber in consequence is at that part of a fixed nature. When, under the application of a fresh exciting cause, a new protrusion takes place, there is an extension in the sac, corresponding to the increased bulk of its contents; but, not improbably, the propelled original neck of the sac does not change, except in its position only; and, remaining of its contracted dimensions, it may become the seat of stricture in the case of strangulation, the new neck proving comparatively free and accommodating. This circumstance has obviously an important bearing on the operation for relief of strangulation.

The *hernial contents* are various, inasmuch as every abdominal viscus is liable to protrusion; but the most frequently affected, by far, are the intestines and omentum; one or other, or both. If intestine alone is protruded, the tumor is said to be an *enterocele; epiplocele*, implying descent of omentum; and *entero-epiplocele*, descent of both. Sometimes only a redundant portion of bowel escapes, in the form of a diverticulum; and this is termed a *Hernia Litrica*.

The *diagnosis* of hernia is a practical subject, obviously of the highest importance. Ordinarily, a hernia is found to be a soft tumor, at the site of an abdominal aperture, receiving an impulse on coughing, and tending to enlargement under exertion of the abdominal muscles in any way, gurgling under pressure, if containing bowel, and capable of being replaced, by pressure, within the abdominal cavity. There are certain affections for which such tumors are especially liable to be mistaken. 1. *Hydrocele* simulates the oblique inguinal hernia, but is to be distinguished thus: Hydrocele is generally more or less translucent, and hernia is almost always opaque; the exception being, when in a large hernia, invested by thin integument, a fold of bowel alone descends, capacious, and filled only with gaseous contents. Hydrocele is a constant tumor, unaffected by pressure; hernia is ever varying by accidental circumstances, and is usually capable of being diminished by pressure, if not made wholly to disappear. The apex of the pyriform swelling,

in hydrocele, simulates the neck of the hernia; but, on careful manipulation, it is found to terminate beneath the abdominal outlet, leaving always some part of the cord clear; and the cord is never at any part clear in unreduced hernia. The hydrocele, unless congenital, has no impulse, and evinces no tendency to enlargement, on coughing, or other exertion of the abdominal muscles. The testicle is felt obscurely, if at all, in hydrocele; in scrotal hernia it is usually found, distinct and separate, at the lower part of the scrotum. The history of the case, too, is widely different; the hernial tumor appears suddenly, and proceeds in development from above downwards; the hydrocele is of gradual formation, and its progress is from below upwards. Not unfrequently, however, be it remembered, hydrocele and hernia coexist. 2. *Hydrocele of the cord.*—This is usually a circumscribed swelling, leaving a portion of the cord clear, above and below, as may be ascertained by careful manipulation; it is not reducible; and it evinces the ordinary negative signs on coughing, or other exertion. When the portion of cord within the inguinal canal is affected by circumscribed serous accumulation, however, the diagnosis may become of great difficulty, as can readily be understood, resting mainly on the reducibility or irreducibility of the tumor. 3. *Cirsocele.*—Ordinary varix of the spermatic veins, and veins of the scrotum, can scarcely be mistaken for hernia; the cord is comparatively clear, the feel of the veins is marked and characteristic. Like hernia, there is diminution of the swelling during recumbency and on pressure; but, unlike hernia, there is return of swelling on resumption of the erect posture, and on abdominal exertion, though the thumb be kept accurately and firmly placed on the abdominal outlet. When there is a swelling, however, at the upper part of the cord, partly within the inguinal canal, and consisting of enlarged veins, perhaps with some serous accumulation, diagnosis is difficult; for the form and history of the tumor are very like those of hernia, and there is an impulse on coughing. We trust to non-reducibility of the entire swelling, and its characteristic feel; on pinching it, the veins roll like earth-worms between the finger and thumb, and the touch of the experienced is usually able to detect the absence of all abdominal descent. This swelling, however, often paves the way for hernia by dilating the canal, and thereby facilitating protrusion. 4. *Bubo.*—The history, progress, form, and feel of bubo must obviously differ very much from those of hernia. The two may be combined, however; a patient afflicted with inguinal hernia, or femoral hernia, may have enlargement of the inguinal glands. 5. *Descent of the Testicle.*—The testicle, descending at an unusually late period, may be arrested in the inguinal canal, causing a painful swelling there very similar to hernia. It is known by absence of the testicle in that side of the scrotum, by the feel of the tumor, and by the characteristic pain which is experienced on pressure being made on the part. Like the high form of cirsocele, it may be the precursor of hernia; a portion of bowel or omentum slipping down behind the testicle, through the abnormally dilated canal. 6. *Sarcocele.*—This is readily distinguished by the history and progress of the tumor, its feel and form, and its negative signs on coughing; the cord, too, is free, except in some cases of malignant disease. 7. *Psoas abscess* is distin-

guished from femoral hernia, by the evidences of spinal disease, by the history of the case, by distinct fluctuation in the swelling, and by the progress of "pointing;" and, most frequently, the site of the abscess is exterior to that of hernial protrusion. 8. *Varix of the femoral vein.*—A bulging varix of the femoral vein, projecting through the saphenic opening, may very readily be mistaken for femoral hernia. The test is simple. Reduce the swelling by pressure in the recumbent posture, and then press firmly on the abdominal outlet; if the case be one of hernia, there is no reproduction of tumor; if it be varix, the swelling quickly reappears.

Reducible Hernia.

At some part of the abdominal parietes, a swelling forms, painful, sudden, usually after some unwonted exertion; at first slightly tense and tender, afterwards soft, compressible, and tolerant of manipulation, increased by the erect posture and by abdominal exertion; and then, too, sustaining an impulse, when held; capable of being reduced, by pressure made in the direction of the outlet through which it has come; often disappearing spontaneously, on recumbency being assumed. An enterocele is smooth, elastic, and more or less globular in form; it gurgles on pressure, and flatulent noises may be emitted spontaneously; reduction, under pressure, is preceded by gurgling, and is often abrupt, taking place *per saltum*. Epiplocele is doughy, and more irregular in form, it emits no noise, and reduction is slow and gradual.

The treatment of reducible hernia may be regarded as analogous to that of dislocation, consisting of prevention, reduction, and retention (*Principles*, 3d Am. Ed. p. 679). Not unfrequently there are premonitory symptoms of protrusion, and then *prevention* is in our power. Pain and slight fulness appear at an abdominal outlet, after unusual exertion. Hernia is about to form. In order to avert it, the exciting cause is removed, by discontinuing all abdominal exertion, as much as possible. And the predisposing cause is met by a well-fitted, lightly-springed truss being worn on the part, so as to strengthen what is weak in the parietes, while at the same time a mechanical obstacle is directly opposed to protrusion.

Should hernia actually form, replacement, or *Reduction*, cannot be too soon effected, inasmuch as the parts protruded are ever liable, from apparently but slight causes, to the supervention of strangulation, a state fraught with the utmost danger to life. To leave a hernia unreduced, and at the same time to continue any laborious avocation, or even to be exposed to but occasional abdominal exertion, is to convert a comparatively unimportant disease into one of a grave character, and to render a life, otherwise good, dependent on a very slender tenure. In life insurance, for example, an applicant affected with a slight but well-trussed hernia is admitted, if in other respects suitable, with only a trifling addition of premium; while he who, with as simple a hernia, and of equally good health in other respects, neither wears a truss, nor otherwise provides against descent, is unhesitatingly rejected.

Reduction is effected by placing the patient recumbent, slightly

elevating the trunk, removing all outward pressure from the abdomen, and in short taking every means to relax the abdominal parietes; then gentle and steady retropellent pressure is made with the hand, in the direction whence the descent has come. Such manipulation is termed the *Taxis*.

Retention is effected by continued and suitable pressure at the site of protrusion; and this pressure is best made by means of a truss—a steel spring, with a compressing pad at the extremity. Of these instruments many varieties have been constructed, but of late opinion seems to have inclined, very justly, towards a decided preference for the simple spring with its ordinary cork pad, provided that the instrument is accurately adapted to each individual case; the pad fitting nicely to the abdominal outlet, not too conical, lest permanency of dilatation should be so maintained, and yet not so flat as unnecessarily to diffuse the pressure; the spring passing about two inches beneath the crest of the ilium, grasping there firmly, and terminating a little way beyond the spinous processes of the lumbar vertebræ; the spring not so strong as to gall the parts by inordinate pressure, and yet strong enough to shut up the opening effectually; a thigh strap passing from the back part of the spring to the pad, so as to prevent that from being displaced upwards; and, to avoid chafing, a piece of folded lint or linen being interposed beneath the instrument, at the site or sites of pressure. At night, the truss may be removed, on the patient lying down in bed. In the morning it is the first article of dress to be adjusted, great care being always taken in regard to two points: 1. That the pad fits accurately; and 2. That there is no descent, however slight or partial, during its application. Should at any time reprotrusion occur, the instrument must be instantly removed, and means as instantly taken for replacement and accurate readjustment.

By careful and constant use of the truss, a radical cure is expected in the child. The predisposing cause is permanently removed; for, descent being prevented, farther dilatation of the outlet does not occur; and, during the general development of structure, the aperture or canal comes to acquire the normal proportion and capabilities. The period during which the truss requires to be worn, for attaining this end, is considerable; from one to three, or more years. In the adult, so fortunate an issue is not to be hoped for; the outlet remains dilated, and predisposed to redescent, on application of but a slight exciting cause; usually, the truss must be worn for life. And yet, a happy incident may occur, in favor of a better issue. Thus, we have seen a phlegmon form under the pressure of a galling pad; the abscess discharged, contracted, and healed; and, on cicatrization, it was found that the extent and site of plastic exudation had been such as to consolidate the outlet, and render farther use of the truss quite unnecessary. And even without such accidental aid, it sometimes, though rarely, happens that a slight hernia disappears under temporary use of the truss, and does not return.

As, in the adult, the truss, however carefully and patiently worn, generally proves but a palliative, *Radical Cures* have naturally been sought for with some avidity. Of these, several have been applied to

the inguinal hernia. What seems the best method is, to adopt the principle of subcutaneous puncture; making several scarifications in the neck of the sac—the cord carefully protected—and then applying accurate pressure over the canal, so as to favor occlusion of its unoccupied part by plastic exudation. Another method is by invagination; pushing a fold of integument into the canal, after reduction of the tumor; retaining the invagination by a suture, at the upper part; and obtaining afterwards adhesion of the invaginated portion of integument, by pressure, after excoriation by means of ammonia. This, however, is found to be both more uncertain, and more unsafe, than the former mode. And neither should be attempted, unless in extreme cases, and at the express desire of the patient; seeing that neither is quite free from risk by excess of inflammatory action. The application of iodine to the neck of the sac has been tried, by puncture and injection; but this method does not seem more promising of success than the other.[1]

Irreducible Hernia.

A hernia is said to be irreducible, which cannot be reduced, and is permanently fixed in its extra-abdominal position. This state may be caused: 1. By adhesion of the sac, on its external aspect, to the parts into which it has been protruded; and by adhesion of its internal surface to the hernial contents. In a neglected hernia of any considerable duration, the former event seldom fails to take place; and to constitute the second, plastic exudation has only to occur on the opposed surfaces. 2. By the nature of the protrusion. The caput cæcum coli is uncovered by peritoneum posteriorly. It may slide down through the parietes; and, presenting at the groin, it may constitute an irreducible tumor—as well as a hernia without a sac. The areolar adhesions of the displaced gut have been extended and shifted but not broken; and they may present an insuperable obstacle to replacement. But it has happened otherwise. The bowel may have a more extensive peritoneal investment than usual; and, instead of merely descending with its fleshy connections, may acquire a complete mesentery—so becoming easily reducible.[2] 3. By contraction of the abdominal cavity. When a large hernia has been long unreduced, it may become permanently irreducible, although no adhesion form between the contents and the sac. The abdominal cavity, having parted with a large proportion of its ordinary contents, contracts upon the remainder; and then there is found to be no room for replacement of the extruded parts, even were circumstances quite favorable for such reduction.

Irreducible herniæ are predisposed to evil. The patient usually suffers from flatulence, indigestion, and constipation. The peristaltic movement of the protruded bowels is imperfect, and to other causes of incarceration and strangulation the part is constantly exposed. Such cases, therefore, require to be watched with unusual care. The bowels are to be carefully regulated; all excitants of intestinal disorder are to be avoided, as well as unnecessary abdominal exertion; and a bag truss

[1] Bigelow, Boston Med. and Surg. Journal, Dec. 1850. [2] Lancet, 1235, p. 462.

must be constantly worn, so as both to support the protruded parts, and prevent the occurrence of farther protrusion. No direct interference is warrantable, with a view to remove the obstacles to reduction. But, should strangulation occur, the ordinary operation is to be performed, for relief of the constriction.

Incarcerated Hernia.

This term denotes a temporary retention of the parts in their abnormal position, without obstruction to the fecal flow, and without the occurrence of inflammatory action. No urgent symptoms call for reduction; but when this is attempted, it is found to be impracticable under existing circumstances. There may be: 1. An enlargement of the hernial contents. The gaseous matter may have become expanded; the fluid and solid contents may have accumulated in unusual quantity; or a portion of extruded omentum may have slowly expanded by increased deposit of adipose tissue; and the tumor, thus enlarged, is too bulky to repass the outlet. Or, 2. While the tumor may be but little changed, the aperture through which it came may be temporarily contracted—preventing replacement, yet not causing constriction and strangulation; and this state may depend on muscular spasm, or on swelling of the parts connected with one or other of the various stages of an advancing inflammatory process.

Treatment depends plainly on the cause. Gaseous contents are diminished by the continued application of cold; solid and fluid, as well as gaseous contents, may be favorably acted on by purgatives and enemata; a fatty omentum may be diminished by pressure and starvation; and, then, the reduced tumor may be pushed back within the abdomen. Spasm is overcome by the warm bath, opium, chloroform, or other antispasmodics; inflammatory exudation is got rid of by antiphlogistics, followed by discutients; and through the cleared outlet a comparatively unchanged protrusion may again be passed. Until this desirable event can be achieved, the part ought to be supported by a bag truss, or otherwise; and every precaution should be taken to avert the occurrence of strangulation—to which such tumors are especially liable.

Strangulated Hernia.

Strangulation is said to have taken place, when fecal flow is arrested in the hernial tumor by tightness of constriction at the neck; and when, usually from the same cause, circulation has been disturbed in the protruded parts, and the inflammatory process is begun. Or the condition may be otherwise defined to be: incarceration, with interruption to both the fecal and the vascular flow, and with an inflammatory process in the protruded parts either following or preceding constriction. For this state of matters, the hernial contents are usually to blame. The constriction may depend on spasm, or other alteration in the abdominal outlet; but much more frequently it is caused by sudden, or at least rapid and unusual enlargement of the protruded parts—in consequence

of which, the neck of the tumor becomes, as it were, jammed at the aperture of descent. A fresh protrusion takes place; or feculent contents accumulate; or gaseous contents become increased; or an inflammatory process is begun in the protruded parts, causing both engorgement and serous effusion. Much more frequently, however, the inflammatory action is consequent to constriction—indeed, caused by it.

The symptoms of strangulation are very marked. The patient is annoyed by flatulence and general uneasiness. The bowels refuse to act; the contents of the lower bowel may be evacuated, but no dejection can be obtained from above the seat of stricture; yet frequently there is a troublesome and urgent desire to go to stool. The tumor is found incapable of reduction; at first it may be flaccid, but it soon grows tense, and tension rapidly increases. Pain is felt in the part; on the increase, and extending towards the abdomen. Sickness comes on, with retching. Then the stomach is emptied; and, vomiting continuing, the upper bowels also eject their contents; the peristaltic movement comes to be wholly reversed, and the vomited matters are stercoraceous. At first, the pulse may have risen to the sthenic and inflammatory character; but now it becomes of another type—denoting the state of Constitutional Irritation, and tending fast to lapse into the typhoid character. The tumor becomes more and more tense and painful—perhaps intolerant of even the gentlest pressure. Great pain affects the whole abdomen, with aggravation and twisting at the umbilicus. Nausea and vomiting continue; the countenance is anxious, pale, pinched, and wet with clammy perspiration; there is great restlessness, and distress is constant; the pulse grows rapid and indistinct; hiccoughing sets in; the tumor becomes less intolerant of manipulation, less tense and painful, and feels doughy and crepitant on being handled. Gangrene has taken place. Then vomiting may cease, and sudden cessation of pain and discomfort may be experienced; perhaps the bowels act imperfectly; and the patient may express himself not only relieved but confident of recovery. Sinking, however, continues; and the fatal issue is not long deferred.

Such is the ordinary course of a strangulated hernia, unrelieved. But there may be another and less formidable termination. In the progress of the case, the integument and other envelops of the tumor become involved in the inflammatory action; at first they are bright red, tense, and very painful; afterwards darker in hue; less painful and tense, cold, phlyctenulous—in fact, gangrened. The contents are in a similar condition. All slough. And, on separation of the mortified parts, copious feculent discharge takes place; relief follows immediately; the urgency of the symptoms is over; and gradual recovery may ensue, with the establishment of artificial anus.

In the preceding enumeration of symptoms, we have first the signs of obstruction, and then those of inflammatory action, in the protruded parts. But this may be reversed. The inflammatory process may be the original affection; caused, perhaps, by a blow—though a less direct and palpable exciting cause may suffice. The tumor is painful and red and swollen, even for some time, while as yet the abdomen is free from ailment, and the bowels are working naturally. The pain and tension

are chiefly at the body of the tumor, in the first instance, instead of at the neck as in primary constriction. But, the inflammatory action continuing, engorgement with effusion takes place, the bulk of the whole tumor is increased, in consequence constriction occurs; and then follow obstruction of the bowels, affection of the abdomen, and aggravation of the local disorder.

The rate of progress varies according to circumstances. When the tumor is small and recent, constriction is usually tight; and, in a few hours, death of the parts, at least if unrelieved, is certain. Whereas, if the hernia be of some size and long standing, and if obstruction precede the inflammatory action, and neither prove urgent, days may elapse ere much mischief be done to either part or system. On the average, however, it is not by days, but by hours and minutes, that the registration of time is made in cases of strangulated hernia. And, by the practical man, these minutes are invariably regarded as of vital importance.

Many, if not all of these symptoms, may exist, independently of either hernia or strangulation. Whenever they do occur, however, hernia is invariably to be suspected, and the necessary inquiry and examination should be made under all circumstances. There may be no tumor found at the ordinary sites of protrusion, or at any other accessible part of the abdominal parietes; then it is probable that the symptoms are independent of hernia—purely abdominal. If a hernia is discovered, of old standing and considerable size, not very tense or painful; if the pain is not greater in the tumor than elsewhere, perhaps not so great; if the bowels are acting, though perhaps imperfectly; if, on inquiry, it is ascertained that the abdominal and general symptoms plainly, and by some considerable time, preceded change in the tumor, then the probability is, that the affection is enteritic or peritonitic, originating in the general abdomen, affecting the tumor secondarily, and perhaps even in a minor degree. When, however, the signs of strangulation are found marked and acute, and the history plainly indicates precedence of the local and extra-abdominal signs of disorder, there need be no doubt that the case is of the ordinary kind—the urgency essentially dependent on strangulation of the hernia.

Treatment of strangulated hernia necessarily varies according to the nature of the case. In general, it may be said that our object is to effect reduction as speedily as possible; saving structure, by favoring decline of the inflammatory process; restoring the normal passage of the intestinal contents; and arresting the disastrous progress of constitutional disturbance. But it is not always good practice to have recourse to the manipulations for reduction immediately; and, in regard to this practical point, the cases may be divided into two great classes; those which are preceded by inflammatory action in the hernia, and those in which this action follows on constriction otherwise produced. The latter, doubtless, are the majority. In the former, it is the natural and proper course of procedure to remove the cause of constriction, if possible, in the first instance, provided the case is chronic enough to admit of this; leeches are applied, and other suitable antiphlogistics are enforced; and when, by such means, the bulk of the tumor has diminished, and the parts have also acquired a better tolerance of manipulation, then

reductive pressure is to be applied, without risk of doing harm, and with a good prospect of proving successful. The inflammatory action has caused constriction; remove the cause, and the constriction is easily dealt with. But, in the other class of cases, the state of matters is reversed. The constriction has caused inflammatory action; and only after removal of the former, can we expect to cope successfully with the latter.

In employing leeches for the relief of hernia, it is well not to apply them to the tumor itself, but to its immediate vicinity; otherwise, the slipperiness which is produced, by oozing of blood, may interfere seriously with the manipulations of the taxis.

In applying the taxis, the patient is placed recumbent, and with the limbs and trunk so arranged as to relax the abdominal parietes to the full;[1] it is well, also, to see that the bladder is empty, and that no bandage, belt, or other outward constriction is affecting the abdomen. The tumor is then grasped with the hands, firmly, yet cautiously; and while with one hand general pressure is made on the bulk and body of the tumor, forcing it in upon itself, as it were, and at the same time pushing it back in the direction whence it has been protruded, a kneading or pinching movement is made on the neck of the tumor by the fingers of the other hand, so as to disentangle and free the part most compacted and compressed. And this is steadily persevered in, for some time, provided the patient do not complain greatly of aggravation of pain and general uneasiness. Our wish is to push the hernial contents back, not in mass, but in detail; those going first which were last protruded. The patient, if not chloroformed, is kept in conversation, to prevent him from straining his abdominal muscles in involuntary opposition to the operator. There is energy, yet no violence of force in the pressure; and it is patiently and steadily maintained, yet not continued too long; that is, not after reasonable hope of its success has passed, and when its maintenance must inevitably tend to serious aggravation of the crescent inflammatory action.[2] Sometimes it is not applicable at all; when, for example, the case is acute, and has made great progress ere assistance is called; when the parts are so obviously intolerant of pressure as to convey to the practised hand and mind the apprehension of texture giving way by rupture under an attempted taxis; also, when we are satisfied that inflammatory action has already gone so far as to render loss of substance, either by ulceration or by sloughing, inevitable in the constricted parts.

Sometimes benefit accrues from an opposite direction of gentle force, previous to the reductive application of it; bringing down the jammed neck from the abdominal aperture, and so favoring a clearance of the passage by an unravelling, as it were, of its contents; causing, in fact,

[1] By some, it is thought that much may be done by position alone; flexing the thighs, rotating the limbs inwards (for inguinal and femoral hernia, especially the latter), raising the nates till the whole weight rests on the shoulders, retaining this position for a time, then lowering and raising again, the hand of the surgeon meanwhile making gentle pressure on the tumor. It is thought that the posturing tends to pull the contents out of their sac.—*Brit. and For. Rev.* April, 1850, p. 491.

[2] For a sample of the injuries done by imprudent taxis, see Teale on Hernia, p. 96.

a slight increase of the descent, before the whole is attempted to be replaced. A bluff forcing of the fundus of the tumor on its neck is especially to be avoided, when replacement is intended; for the effect of this, in the case of protruded bowel, is not only to jam the parts yet more, but actually to favor formidable accession to the tumor's bulk by traction from the aperture downwards.

Failing in the well-applied taxis, we naturally look for *Auxiliaries* to it; and we find a catalogue of these, analogous to the aids of reduction in dislocation (*Principles*, 3d Am. Ed. p. 681). Some act on the contents of the tumor, tending to reduce bulk; others affect the abdominal outlet, tending to enlarge space; and the latter act well, not only in those cases in which spasm of the abdominal parietes is the cause of constriction, but also in those in which the abdominal outlet may be of the ordinary dimensions, yet quite unfit for return of the impacted textures which it happens to contain; in other words, they are of use in relaxing muscular fibre, not only in a spastic but also in a normal state —making easy room, either way, for replacement of the dislocated parts. And here it may be stated, that though in many cases the abdominal outlet is in the first instance free from change, and constriction depends on alteration in the contents; yet, strangulation having occurred, the abdominal parietes at the site of the hernia become involved in perverted action, and sooner or later are irritated into spasm. And hence it is, that the most useful auxiliaries are such as tend to abdominal relaxation. 1. *Venesection* is advisable in but a few cases; in the comparatively young and robust, of inflammatory tendency, tolerant of loss of blood; with a tight strangulation yet recent, marked signs of advancing acute action in the parts, and the constitutional symptoms still evincing a sthenic type. In such cases, bloodletting—one copious and rapid abstraction from the arm—is of use, by both combating this advancing action, and at the same time, tending to cause complete prostration of the muscular system—the abdominal parietes of course included. 2. The *Warm bath* has similar tendencies; and is obviously more generally applicable, inducing temporary depression; gaining the desired end, yet saving the system from actual loss. If there be time, this is one of the best means of assisting the taxis. The patient is placed recumbent in the bath, with the abdominal parietes relaxed by posture; and, when faintness is beginning to be complained of, the taxis is resolutely applied. It may fail; but the opportunity by the bath is not yet over. Let the patient be replaced in bed; in a few minutes he will be found deluged in perspiration, with a muscular system more prostrate than before; and then the taxis is most likely to succeed. 3. *Fomentation* is inapplicable; by rarefying the gaseous contents, and favoring exudation, it increases the bulk of the tumor; and it is too feeble and limited in its relaxing effect, to act favorably on the abdomen. 4. *Antimony*, as a nauseant and prostrating agent, is very inferior to the bath; adding greatly, and in a dangerous degree, to the irritability of the stomach, and to the downward tendency of the constitutional symptoms. It is inapplicable. 5. And, for a like reason, let *Tobacco* be used very warily, if at all. By other, less hazardous, and more manageable auxiliaries, our object may be as speedily ob-

tained. 6. *Opium* is deservedly in much higher repute; following bloodletting in the marked cases of an inflammatory nature, given singly in others; the dose a full one, not less than one or two grains—for the adult. The beneficial effect is twofold. Constitutionally, the system is rendered more tolerant of the depressing effects of strangulation; the remedy being, in fact, equally useful here as in the case of intense abdominal inflammation unconnected with hernia (*Principles*, 3d Am. Ed. p. 171). Locally, very great service is obtained by muscular prostration, so soon as the full narcotic effects of the drug have been established. This requires time, however; and consequently opium, like the warm bath, is not applicable to all cases—at least as an auxiliary of the taxis; for, in all, there is not time to await the operation of the remedy. 7. *Chloroform*, as has elsewhere been stated (*Principles*, 3d Am. Ed. p. 743), is almost equally serviceable here as in dislocation; producing thorough relaxation, not aggravating collapse, quickly passing off, and leaving no unpleasant trace behind. 8. *Glysters of acetate of lead*, each containing ten grains dissolved in about six ounces of water, have been employed with success; repeated, if necessary, every two hours.[1] 9. *Purgatives* are in all cases of strangulation most unwarrantable. The bowel is locked; and the stimulus of purging, quite unable to undo the locking, acts but injuriously, in applying a stimulus which cannot be obeyed, and aggravating an already crescent inflammatory action. In the case of incarceration, the wary use of purgatives is often serviceable in unloading the protruded bowel; but in the tighter degree of constriction, causing strangulation, they are never to be thought of. 10. *Enemata*, however, have a different character. When simple and bland, however freely and largely administered, they have not the pernicious properties of purgatives—more especially, of those which are drastic and given by the mouth. Besides, they are positively of use, by disburdening the lower bowels of their contents, both solid and gaseous; and so making room within the abdominal cavity for reception of the extruded parts. And experiment would also lead us to suppose that they have a mechanical tendency to extricate, by exciting traction, from within, on the constricted and protruded bowel.[2] 11. The long elastic *Rectum-tube* is also both safe and useful, when passed high and cautiously, so as to reach the colon; the object being to evacuate the gaseous contents of the lower bowels more thoroughly than enemata can do, and so to make room within the abdomen. But, obviously, such a proceeding is only applicable to those cases in which distension of the lower bowels exists. 12. Some auxiliaries affect the tumor mainly. Certain cases, we have already seen, render it necessary that local bloodletting should precede the taxis. Fomentation has been thought of, but is found worse than useless. The *application of Cold* is sometimes of the greatest service. Applied indiscriminately, it will do harm; but limit its use to those cases which are chronic in their progress, in which the signs of obstruction plainly precede those of inflammatory action, and in which the inflammatory process affecting

[1] Brit. and For. Rev. Jan. 1849, p. 271.
[2] Lancet, No. 1035, p. 468.

the tumor is not only slight, but scarcely begun—then the effect is often most favorable. The gaseous contents being condensed, bulk is diminished; muscular energy is probably somewhat lowered, and space is gained; and, perhaps, by puckering the investments of the tumor, some little reductive pressure may be so exerted. But act as it may, there is no doubt that the local application of cold tends wonderfully to assist the taxis, in the class of cases just described. It may be applied by sprinkling the tumor and surrounding parts with ether, and keeping up a continuously rapid evaporation by directing a current of air upon the part. Should this fail, great care must be taken for some time not to apply heat suddenly to the part, by fomentation or bath, or otherwise to cause rapid exaltation of temperature, for very obvious reasons (*Principles*, 3d Am. Ed. pp. 155 and 272). Ice and freezing mixtures are less suitable; being apt, by doing too much, to act injuriously on the hernia's contents. 13. *Acupuncture* has been proposed, when the constricted bowel is obviously distended by gaseous contents. But the use of cold is likely to obtain the same end, as effectually, and more safely. 14. *Posture* may be rather considered as a part of the taxis, than as auxiliary to it; so invariably is it to be attended to. It necessarily varies, in details, according to the site of the protrusion. Its main object is ever the same; to relax the parts through which reduction has to be made. In hernia at the groin, as already stated, it has been thought that elevation of the pelvis, with a hanging position of the recumbent body, has been of use in exerting an extricating traction on the strictured parts (p. 395).

The most available, and most generally used of these auxiliaries are: bloodletting, local in all the inflammatory cases, and general in the few examples which admit of it, the warm bath, opium, chloroform, simple enemata, in large quantity, perhaps the long tube, in the chronic and uninflamed cases, always the local application of cold. If the taxis is to succeed, a yielding of the tumor is felt beneath the hands, the contents are plainly shifting; then a gurgling noise is heard, denoting replacement of the gaseous contents, always a welcome sound, and speedily thereafter the solid matters recede, sometimes very gradually, often as it were *per saltum*. A truss, or suitable compress and bandage, is instantly applied; the patient is confined to bed, recumbent; antiphlogistic regimen is strictly enforced; after some hours, an enema may be given, if the bowels have not acted spontaneously; but not till after many hours should even the simplest purge be given by the mouth, it being well-ascertained that the loop of bowel included in the stricture remains long in a paralytic state, and incapable of obeying the peristaltic stimulus. There is, in short, the same serious objection to purgatives immediately after reduction, as during the existence of strangulation. Should peritonitic or enteritic symptoms threaten, the usual antiphlogistic treatment must be had recourse to, both early and with energy. Not unfrequently, after tight constriction, discharge of blood takes place *per anum*, this doubtless being furnished by the mucous coat of the lately strangled part.

It may happen that under forcible application of the taxis, in a recent hernia, the tumor recedes suddenly, in mass. This is not desirable.

For, it is not improbable that the untoward symptoms may continue quite unchanged, the reason being that the sac and its contents have been reduced together with their relations unaltered, and that the neck of the sac continues to constrict the omentum or bowel, as before. In such a case, treatment becomes embarrassed. But most surgeons are of opinion that we are required to expose the abdominal outlet by operation, in search of the yet strangulated bowel, aiding that search by making the patient cough, or otherwise exert himself, so as to favor redescent of the hernia. An operation under such circumstances is much more promising of success than Gastrotomy, on account of an undefined internal obstruction (p. 382). For in this case the cause of strangulation is plainly in the sac, and that is within reach at a fixed point, the parietal relations of the sac being likely to detain the reduced mass close to the site of protrusion.[1]

The operation for strangulated hernia is unhesitatingly to be had recourse to, so soon as the taxis, with such auxiliary means as seem advisable, has been fairly tried, without success. The great majority of experienced surgeons agree, that in regard to this operation error is more frequent on the side of delay than of precipitancy. Two circumstances demand its instant performance; a conviction that by no other means, than by the edge of the knife directly applied, can the abdominal outlet be so enlarged as to relieve constriction and admit of replacement; also, a conviction that already inflammatory action has advanced so far, that either ulceration or sloughing is inevitable in the protruded parts. In the one case, we operate to relieve the stricture and effect replacement, hoping to arrest inflammatory action; in the other, we operate to relieve the stricture, and, leaving the hernia unreduced, prevent fatal extravasation of intestinal contents within the abdomen—hoping also to limit inflammatory action to the directly implicated parts. The danger of strangulation is twofold; formidable disturbance of the system, and untoward inflammatory progress in the tumor. Both dangers advance, in most cases, with rapidity. And if we wish to meet them successfully, the measures of relief must be not only suitable but early; in other words, time, all valuable, must not be wasted in ineffectual attempts at the taxis, when the case at all partakes of an acute character. Large herniæ are more hopeful of reduction than the small; the inguinal protrusions are more hopeful than the femoral.

It has been proposed to relieve the stricture by means of subcutaneous section. But this proceeding is obviously so beset with danger and uncertainty as to be quite inapplicable.

The seat of stricture is exposed by careful and regular dissection; the incisions necessarily varying in their plan, according to the kind of tumor. Having cautiously divided the integuments and fascial envelops, the sac is exposed, clear and glistening, resembling very much the peritoneal coat of the bowel; and there may be some difficulty in ascertaining whether it is the sac or bowel. By pinching it up, so as to show bowel separate beneath; or by observing serum, fat, or a portion of

[1] Monthly Journal, Retrospect, Feb. 1849, p. 35.

omentum between, we arrive at a sure diagnosis. But, this difficulty having been surpassed, another immediately arises. The sac having been exposed—or nearly so—are we to open it, examine the state of its contents, and divide the stricture from within; or are we to attempt division of this from without, leaving the peritoneum intact, and so escaping the danger of peritonitis? So long ago as 1720, Petit proposed this modification of the procedure—leaving the sac unopened; and the proposal has met with a varied reception since—inclining to distrust rather than otherwise. Lately, however, it has been revived under better auspices; and in suitable circumstances, it may be considered as the established and preferable practice. Were it applied indiscriminately, nothing could well be conceived more pernicious; bowel or omentum might be reduced when they ought not; or, one stricture having been relieved, another might be left—this second existing in the sac, perhaps below its proper neck, and continuing to embrace the hernial contents with fatal tightness after reduction. But, limit it to those recent cases of strangulation in which we are certain that the hernial contents are sound and reducible, and in which we are also certain that the only stricture is that which we propose to divide—then, doubtless, the extra-peritoneal operation is by much to be preferred. It is also suitable in cases of irreducible hernia, which have become strangulated; and in which, from their large size, the exposure of peritoneum may reasonably be expected to prove especially hazardous.[1]

If the case appear favorable for extra-peritoneal division, the investing textures are carefully divided at the neck of the tumor, so as to admit the point of the finger, or at least the finger's nail, within the tight orifice of the abdominal aperture; and then on the finger's point, so introduced a probe-pointed bistoury is passed, and by it the necessary enlargement is effected. If the stricture be in the neck of the sac itself, even that may perhaps be relieved extra-peritoneally, by carefully scratching the outer part by the knife's point.[2] Then the taxis is applied; the parts are reduced—the contents going first, and gradually, otherwise stricture might remain after reduction; if the unopened sac be non-adherent, it is pushed back also; the wound is brought together; and by suitable adaptation of compress and bandage, and avoidance of the ordinary exciting causes, reprotrusion is prevented.

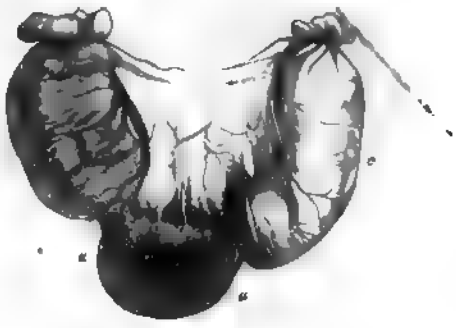
But if it be deemed expedient to proceed in the ordinary way, the sac is pinched up by forceps; choosing a part where serum or fat interposes between it and the bowel—and that will generally be towards the fundus of small herniæ. By the knife's edge, held horizontally, the raised fold is divided. Through this aperture the point of the finger is introduced; and, on this, as the best director, dilatation of the opening is made to such an extent as may be deemed advisable. However large

[1] Indiscriminate performance of the extra-peritoneal operation must often lead to serious and fatal error. Selection must always be carefully made. For objections to the operation, *vide* Hancock, *Observations on the operation for Strangulated Hernia*, Lond. 1850.

[2] According to Mr. Luke, the site of stricture may be ascertained previously to operation, by making impulse on the fundus of the tumor with one hand, while the other is placed on the neck. Wherever impulse stops, there is the stricture.—*Med.-Chir. Trans.* vol. xxxi.

the hernia, the opening of the sac need not be of greater extent than what is merely sufficient for ascertaining the state of the contents, and permitting the finger to reach the site of stricture. The point of the forefinger having been passed up to the abdominal aperture, the probe-pointed bistoury is slid flatly along it; and, by the point's edge, pressed upon the stricture; this is divided to the necessary extent. Then the hernial contents, if sound and reducible, are replaced gently, portion by portion—the last protruded first. Recent and tender adhesions may be gently broken up with the finger, or touched with the edge of the knife; but consolidated adhesions, if at all extensive, render the parts irreducible—they should not be interfered with. When there is any considerable portion of omentum in the sac, it should be carefully examined, to ascertain whether or not it conceals—perhaps strangles—a knuckle of intestine. If the sac be not adherent, it is replaced as well as its contents, but not along with them; for, reduction is found to be facilitated by an assistant's finger steadying and stretching the sac, while the contents are pushed upwards on its smooth and slippery surface. Reduction having been accomplished, the wound is brought together, and suitable pressure applied. Approximation by suture should not be complete, however; for union by adhesion is not desirable, otherwise danger might accrue from the secretions in the deep wound finding their way into the peritoneal cavity. They should be allowed a free outward drain.

Fig. 173.



a a. The portion of bowel which has been protruded; constricted, dark, and engorged. At *b*, the upper, or cardiac portion, dilated, and of dark color. At *c*, the lower portion, comparatively empty, flaccid, and pale.

When hernia is irreducible, we content ourselves with division of the stricture. If the contents are sound, the external wound is approximated with a view to adhesion. If the contents are found gangrenous, or verging thereto, the wound is left open, to permit free discharge of the feculent contents.

If, on exposing the contents of a reducible hernia, the bowel be found merely congested; ruby-colored, it may be; perhaps spotted by points of ecchymosis, or showing one or more vesicles of the peritoneal coat, it is reduced unhesitatingly. If showing signs of plastic exudation on its surface, it may still be reduced; no structural change has taken place but what may be recovered from. But if the bowel be dark-purple at some part, greenish at another, and perhaps ash-colored at a third, friable, and evidently fast passing into gangrene, under no circumstances is it to be reduced, else fatal feculent extravasation must ensue. And if omentum be found dark-red, emphysematous, and with its venous blood coagulated, it too must be left to slough in its outward site; in either case, however, as much care being taken to free the neck of the tumor by division of the stricture as if the whole were fit for reduction.

of gangrened bowel, it is also well to incise the sloughing part so as to relieve by immediate and copious feculent evacuation. Afterwards, the treatment is as already described for artificial anus (p. 371). In the case of gangrenous omentum, two modes of procedure are in our option. We may cut off the gangrened part, having previously satisfied ourselves that there is no portion of bowel within the mass, secure the vessels by fine ligatures, and return all within the abdomen. Or, having cut off the gangrened part, and secured the bleeding points, we may leave the rest still impacted in the abdominal outlet, with a view to its becoming permanently fixed there, and so preventing all future tendency to protrusion. The former method, though not free from risk by bleeding and inflammatory exudation within the abdominal cavity, is usually preferred; the latter being often followed by uneasy sensations in the part, and proneness to abdominal disorder.

In all cases of doubt as to viability of the strangulated parts, reduction should at least be delayed. It is never to be forgotten that, notwithstanding relief and replacement, inflammatory action may still advance in the bowel, so as to cause loss of continuity by ulceration. And if this take place within the abdomen, and be followed by feculent escape, the patient's doom is sealed.

Sometimes, after opening the sac, stricture at the ordinary sites is sought for in vain. In such cases it is likely to be found in the hernial contents themselves; a portion of omentum, for example, may encircle a portion of bowel. This is detected by careful manipulation, and is to be gently undone by the fingers, perhaps aided by a touch of the knife.

After successful reduction, by operation, the same treatment is required as in the case of simple taxis; rest; recumbency; antiphlogistic regimen; leeching, and other antiphlogistics,[1] if inflammatory symptoms supervene; hydrocyanic acid or creosote, if the stomach continue irritable; bland enemata; but no purge by the mouth, however simple, until many hours have elapsed; otherwise, as already stated (p. 398), dilatation with obstruction will take place above the palsied portion of intestine, and the patient will probably sink under symptoms of ileus. If intestine previous to reduction have shown an advanced stage of the inflammatory process, antiphlogistics are especially necessary, both local and general, in order to avert, if possible, ulceration, or other dangerous structural change.

When the case is of the obscure nature already described (p. 394), and it is difficult to say whether the hernia is to blame or not for occurrence and persistence of the untoward symptoms—let the operation for relief of stricture be performed. When the tumor itself is of an ambiguous character, when we are not certain whether it is a hernia or not, and yet the ordinary symptoms of strangulated hernia are present, again let the surgeon operate. It is well that he should approach error on the safer side.

After operation, the greatest attention must be paid, for some days, to prevent reproduction of descent, by keeping the compress accurately

[1] Dieffenbach is afraid of calomel; supposing that it acts injuriously on the bowel, and is apt to induce an unhealthy state of the wound.—*Vide* his *Operative Surgery*, 1845.

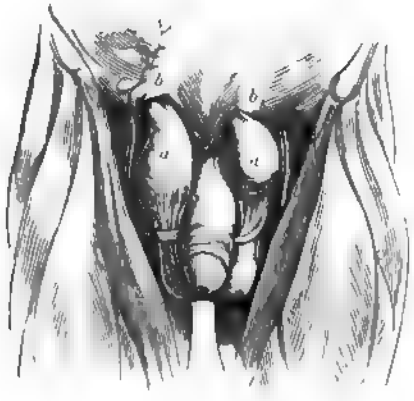
applied, and avoiding the ordinary exciting causes. Should reprotrusion take place, by coughing, restlessness, or imprudence of the patient, the dressing must instantly be undone, and replacement effected. When the sac remains unreduced, simulation of redescent is apt to take place, by serous accumulation within the sac, especially if the integumental incision be closed; but this state is at once detected and remedied, on opening up the wound. After cicatrization, a well-made truss must be worn, as in ordinary cases, for it is seldom that the operation for relief of stricture effects a radical cure.

Oblique Inguinal Hernia.

This is by much the most common form of hernia, in the male. Descent takes place along the spermatic cord, through the inguinal canal; the tumor shows itself external to the parietes, at the lower aperture, and thence descends into the scrotum in the male, constituting an *oscheocele*, or scrotal hernia; into the labium of the female, constituting labial hernia. The investments of the tumor are as follows: externally, the integument; then the superficial fascia of the abdomen; then the proper fascia, or fascia propria of Camper, consisting of fibres from the tendon of the external oblique; then the fascia cremasterica, consisting of fibres from the cremaster muscle; then the infundibuliform, or transversalis fascia, consisting of a prolongation of the fascia transversalis abdominis; lastly, the sac.

As the tumor is about to descend, a painful fulness is found opposite the upper abdominal aperture, increased by abdominal exertion, and sustaining an impulse upon coughing. Then is the time for applying a truss carefully, and avoiding exciting causes, with a view to prevention of the hernia. The pad of the truss should compress the superior ab-

Fig. 174.



ion of Inguinal Hernia; on the right side oblique, on the left direct. *a*. The hernial sac. *b*. The epigastric artery. (After Tiedemann.)

dominal aperture, not the lower; otherwise there is room enough for hernia, and strangulated hernia too, within the abdominal parietes.

To reduce this form of tumor, the pressure of the taxis is applied obliquely upwards and outwards, in the direction of the inguinal canal. In large tumors of old standing, however, it must be remembered that the canal becomes shortened as well as more direct, the two apertures coming to be almost opposite to each other; and this is attended to in the taxis. The patient is laid recumbent, with the trunk raised, and the thighs flexed and approximated.

In the operation for strangulation, a simple straight incision is made along the neck of the tumor, beginning a little above the aperture of protrusion, and extending downwards on the tumor, as far as may be deemed necessary. The deep cut for relief of stricture, is made directly

[Fig. 175.]

[Representation of the appearance of a large inguinal Hernia, and of the direction of the incision to be made in the operation. (From Fergusson.)—Ed.]

upwards, in order to avoid the epigastric artery, which courses behind and to the inside of the hernia's neck. The spermatic cord is usually behind, and out of harm's way, but sometimes it is split up and scattered over the neck of the hernia, and then caution is required to avoid the spermatic artery and duct. The stricture may exist at one of three points: in the margins of the lower abdominal aperture, in the superior abdominal aperture, in the neck of the sac itself. Sometimes a double stricture exists, each abdominal aperture being at fault. The ordinary site is at the lower outlet, but if, after free division of this, reduction is still opposed, the superior site is at once to be suspected, and explored accordingly.

At this site, it is to be remembered, a small strangulated hernia may exist, with scarcely any perceptible swelling; a minute portion of bowel being tightly embraced by the margins of the superior abdominal aperture. The symptoms are likely to be mainly those of enteritis, and attention may not be directed to the groin. In such circumstances the patient has great risk of perishing; unless, by sloughing and abscess, outward discharge occur, with establishment of artificial anus.

There are sub-varieties of inguinal hernia: 1. *The intermuscular Hernia.*—This is more liable to occur in females than in males; the bowel meeting with obstruction in its ordinary descent. Having passed

the internal aperture, it turns towards the ilium, and lodges between the abdominal muscular layers, above and exteriorly to its point of exit. On account of this unusual site, diagnosis may be somewhat obscure.[1]

2. The *Congenital Hernia*.—This is a very simple deviation from the normal state of parts; dependent on imperfect development. It is not likely to take place till after birth; for not until after inflation of the lungs are the exciting causes applied. But so soon as the child is born, the exertion of crying brings down a portion of bowel or omentum along the open process of peritoneum, which exists in consequence of that which constitutes the tunica vaginalis testis having not been occluded. There is no sac, unless the tunica vaginalis be considered as such; the bowel or omentum lies within the cavity of that tunic, in contact with the testicle—sometimes adherent to it, in which case the tumor is irreducible. Occasionally, a portion of bowel contracts adhesions to the testicle while within the abdomen, and, descending with it at the usual time, constitutes this form of hernia before birth.

Fig. 176.

Diagram illustrating the state of parts in Hernia Infantilis. (Liston.)

Strangulation may occur at any time; it has happened to an infant of but a few days old, and required operation. This is performed as in the ordinary tumor. In the reducible cases, a carefully adjusted truss is worn constantly; preventing protrusion; tending to obliterate the peritoneal opening; and so, speedily and surely, effecting a radical cure.

3. *Hernia Infantilis*.—This term is applied to a more complicated state of parts, originating also in early life. The communication between the cavity of the tunica vaginalis and that of the abdomen is shut at its upper part; but the former cavity is unusually spacious, and ascends high in the cord, containing more or less serous fluid. Behind this a hernia descends, invested by the ordinary peritoneal sac. In cutting down on such a tumor, we divide first the anterior portion of the tunica vaginalis, then the posterior; and, after this, appear the sac and its contents, unless the former, as is not unlikely, be incorporated with the posterior layer of the tunica vaginalis. This form is of rare occurrence.

Ventro-inguinal Hernia.

This is also called the *Direct* inguinal hernia. Descent is unconnected with the superior abdominal aperture; and takes place through the abdominal parietes, immediately opposite the lower aperture—the common tendon of the internal oblique and transversalis muscles giving way at that point. Sometimes, however, that tendon is pushed before the tumor, and forms one of its investing fasciæ—protrusion in that case

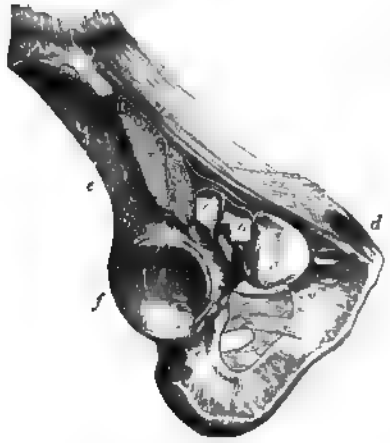
[1] Luke, Medical Gazette, March 15, 1850.

not being through the lower abdominal aperture, but near it. The ordinary coverings are similar to those of the oblique variety; only, this descent being not directly connected with the cord—which is on its outer aspect—there is no cremasteric expansion. The course of the epigastric artery is external to the neck of the tumor (Fig. 174). And hence the general rule, in all cases of inguinal hernia, when strangulated, is to make the deep relieving incision directly upwards, parallel to the linea alba; whether the descent be direct or oblique, the artery is safe. In the direct form, the pressure of the taxis is made directly upwards.

Femoral Hernia.

This is most frequent in females; the greater space, in the normal state of the parts, obviously favoring protrusion. Descent takes place through the crural aperture, on the inside of the femoral vessels, and through the saphenic opening of the fascia lata. In the crural aperture the neck of the tumor is contained; the fundus, resisted in its descent on the thigh, makes a sharp turn upwards, and lies on the lower part of the abdominal parietes; the neck is beneath Poupart's ligament, the fundus may be above it. And this must be attended to in applying the taxis; the tumor being invariably unbent, as it were, and made straight ere the reductive pressure is applied. The tumor is usually of small size; often not bigger than a pigeon's egg; sometimes it is of even huge dimensions; but its average bulk is much below that of the inguinal varieties. The coverings are, integument; the superficial fascia of the thigh; the fascia propria, obtained from the femoral sheath, and continuous with the fascia transversalis and fascia iliaca; lastly, a covering obtained from the textures which normally occupied and occluded the crural aperture. Very often the two last-named coverings are matted together, into one dense fascia; and thus we may expect occasionally to meet with but two investing layers; one the superficial fascia; another beneath it, deep, dense, and strong. Not unfrequently the deep layer splits at its lower part; and the fundus of the tumor, emerging through the aperture, may be covered only by the superficial fascia and integument.

Fig. 177.



Plan of Femoral Hernia. *a*. The sac. *b*. The femoral vein. *c*. The artery. *d*. The abdominal ring. *e* Section of the psoas and iliacus muscles. *f* The acetabulum. (From Druitt.)

There are two peculiarities in applying the taxis to this tumor. The position of the patient is as for the inguinal; but with the limb on the affected side bent much upwards, and at the same time carried across

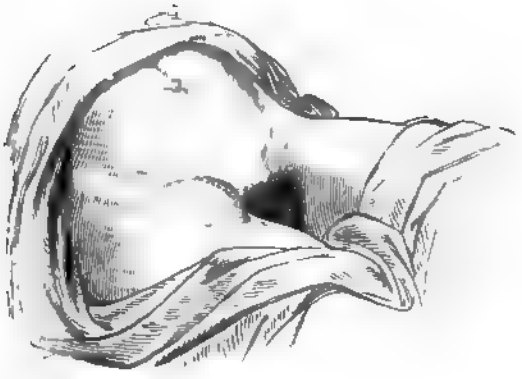
its fellow, so as to relax the crural arch, on which, and not on Poupart's ligament, constriction depends. The pelvis, too, may be alternately raised and depressed (p. 395). Also, as already stated, the neck of the tumor must be unbent and straight, before reductive pressure is made on the fundus; in other words, the tumor is first pushed down on the thigh, and then upwards into the abdomen. After reduction, a well-made truss is applied; the pad resting on the outside of and beneath the spine of the os pubis.

Fig. 178.

Femoral Hernia, of unusually large size.

Strangulation is both more common and more severe than in the inguinal forms of hernia; and, consequently, operation is more frequently required. It is performed thus: The skin having been pinched up, is divided by transfixion, in order that there may be no risk of injury to the important parts be-

[Fig. 179.]



[Ordinary site and appearance of Femoral Hernia, with the direction for an oblique incision. (From Fergusson.)—Ed.]

neath. The form of this integumental wound may be greatly varied; an inverted T; an inverted Y; a V; a simple oblique cut; or the investing textures are cautiously divided, by the forceps and knife, the latter held horizontally; and the sac is exposed. In may cases, the opening of it cannot be avoided. And, this having been done, the forefinger of the left hand is passed up to the neck of the tumor. Here, as in the oblique inguinal hernia, there may be two strictures, a superficial and a deep. The former is considerably anterior to the ligament of Gimbernat, and inde-

pendent of it; formed by the inner and anterior part of the crescentic portion of the crural arch; felt tight, on the inside of the tumor's neck, while the finger's point is yet at some distance from the actual brim of the pelvis. This resistance is divided by a probe-pointed bistoury, slid flatly along the finger, and afterwards having its edge directed upwards and inwards. Dilatation is then made by the finger; and, on withdrawing this, reduction may be effected readily. If not, then the finger is reintroduced; and, pushing it upwards, Gimbernat's ligament is felt tight and resisting, on a higher level than the former site of constriction. It is divided in a similar way, the bistoury's point being barely insinuated within the pelvis; the least movement of its blade suffices; a notch in the edge of the ligament is enough; the finger, following, dilates. Were the deep incision to be made directly upwards, Poupart's ligament would be divided—an unnecessary act, that texture being unconnected with the constriction; and, besides, the spermatic cord in the male, and the round ligament in the female, would be endangered. If the obturator artery arise by a common trunk with the epigastric, it is likely to encircle the neck of the sac within the pelvis. And were the bistoury, which divides the higher stricture, to be used rashly, without the guard of the finger, and with any part of its blade thrust over the brim of the pelvis, this vessel would, doubtless, run no slight risk of being wounded. But, with ordinary precaution, the forefinger preceding the knife, and merely the bulbous point of the latter within the pelvic brim, the vessel is safe, whatever be its distribution.[1]

Fig. 180.

Portion of Bowel, not including its whole caliber, which was caught and strangled at the crural aperture; the symptoms, though modified, proving fatal. During life, no tumor could be discovered at the site of protrusion. (Liston. His *Elements*, p. 536.)

In the extra-peritoneal operation, a smaller wound suffices than in the ordinary method. It is placed on the inside of the tumor, at its upper part; and by means of it, it may be in our power satisfactorily to relieve the stricture, without any interference with the hernial sac. Should this fail, and there be reason to suspect that the stricture is in the sac itself, it is necessary to enlarge the wound, disclosing the parts more thoroughly; and then we may attempt relief by scratching through the faulty external fibres, as in inguinal hernia (p. 400). Failing this, the sac is opened, and the operation completed in the usual way. The after treatment is as for the inguinal operation.

It is in femoral hernia that we are most liable to be puzzled, as to the exact nature of the tumor. But the safe general rule, as formerly stated (p. 402), is—when in doubt, operate.

[1] For greater safety, it has been proposed to use a knife wholly blunt in the edge. This, pressed upon the resisting tight fibres, may dilate or tear them, while the elastic artery escapes all injury.

Umbilical Hernia.

This is common in infants; and in women who have borne many children, it is not unfrequent. In the former it very readily occurs; the exertion of crying forcing the bowel or omentum outwards, through the yet unconsolidated umbilicus; forming a soft, impulsive tumor; at first of small size, not larger than a button—commonly called "a starting of the navel." In women, unless congenital, it is seldom a true umbilical hernia; protrusion having taken place near, not through, the navel—in consequence of a yielding of the abdominal parietes there, probably during parturition. Strangulation is comparatively unfrequent. In the adult, the tumor may attain to an enormous size.

In the child, treatment is both simple and effective. The exciting causes—especially crying—are averted, as much as possible. And compression is made by means of a conical pad—such as a piece of cork, covered with wadding or soft leather—which is made to occupy the space usually filled by the protrusion, and is retained in its place by strips of adhesive plaster; the integument is closed over it in a fold; and the whole may be secured by a large circular piece of soap-plaster spread on leather. This simple contrivance is more effectual than any truss or belt, being much less likely to slip; and it has the equally important advantage of not acting as an excitant of protrusion elsewhere. Or the pad may be secured in its place by means of a belt of elastic material. In the course of a year or two—it may be of months only—the parts are found consolidated, and farther use of the compress is unnecessary.

In the adult, the case is not so easily managed. The tumor is larger and less repressible. A corresponding compress is necessary, secured either by a belt or by the spring of a truss. Its use is merely palliative. When strangulation occurs, relief is obtained in the ordinary way; by taxis, or by operation. The external wound need not be of large dimensions; most frequently, the hernial contents are found to have no coverings but the integument and the sac; the deep incision for relief of constriction, made by a probe-pointed bistoury on the fore-finger, is placed in the mesial line, usually on the lower aspect of the swelling. The taxis is made directly backwards.

The other varieties of Hernia.

Ventral hernia is a protrusion at any part of the front and sides of the abdominal parietes except the navel and groins; the result of a giving way at some unusual point, in consequence of bruise, wound, abscess, or muscular rupture. There are no peculiarities in the tumor or its treatment; excepting that, as in most cases of the last-mentioned variety of hernia, but few fasciæ need be expected to invest the sac. A *Perineal hernia* is said to exist, when bowel or omentum, with its sac, descends between the bladder and rectum, and presents itself as a swelling in the perineum. The term *Vaginal* is applied, when, in the female, the tumor does not reach the perineum, but bulges into the vagina.

Descent has also taken place through rupture at the fundus of the uterus.[1] The *Diaphragmatic* or *Phrenic* (p. 385), and the *Ischiatic* forms of hernia—protrusion through the diaphragm and the ischiatic notch—are fortunately rare. They do not admit of accurate diagnosis in life; and are not amenable to surgical treatment, if strangulated—unless the history of the case happen to be so unusually plain, as to warrant incision.[2] The *Obturatorial Hernia*—projecting through the foramen ovale—may be both discovered and relieved. In one case a painful elastic tumor over the foramen ovale was reduced by the simple taxis, with complete relief to all the symptoms of strangulated hernia.[3]

The *Hernia Litrica*, as noticed by M. Littré, is said to exist when the protruded viscus is a diverticulum of bowel, not a portion of the normal caliber of an intestine.

Fig. 181.

Diverticulum of the Intestine. Its protrusion constitutes the Hernia Litrica.

The diverticulum may be congenital; a mere prolongation of bowel, consisting of all the normal coats. Or it may be of recent occurrence, formed by a protrusion of the mucous membrane of the intestine through its muscular coat, and consisting of the mucous and peritoneal coats alone. Both forms, the *diverticulum acquisitum* as well as the *diverticulum congenitum*, are liable to hernial protrusion; the former found only at the crural aperture, and always of slow formation (Fig. 180). This form of diverticulum being made at the expense of the main bowel, the caliber of the latter is narrowed thereby; and the traction caused by hernial descent also changes the line of direction in the bowel, forming a sharp angle at the origin of the diverticulum. Above the narrowed and somewhat obstructed part, dilatation takes place; and a train of unpleasant symptoms result, independently of strangulation—costiveness, colicky pains, dyspepsia, flatulency, &c. The congenital form of diverticulum, on the other hand, may protrude without causing any such inconvenience. Strangulation, occurring in either case, is marked by the ordinary symptoms, follows the ordinary course, and requires the ordinary treatment. But, probably, the symptoms will partake more sparingly of the signs of obstruction, than in ordinary cases, at least in the first instance.[4]

Littré, Mémoires de l'Académie des Sciences, Paris, 1700. Pott, Chirurgical Works, by Earle, vol. ii. Lond. 1808. Scarpa on Hernia, by Wishart, Edin. 1814. Cloquet, Recherches Anatomiques sur les Hernies de l'Abdomen, Paris, 1817. Liston, Memoir on the Anatomy of Crural Hernia, Edin. 1819. Cooper, A., The Anatomy and Surgical Treatment of Abdominal Hernia, by C. A. Key, Lond. 1827. Key, C. A., on the Advantages and Practicability of Dividing the Stricture in Strangulated Hernia on the Outside

---

[1] Lancet, No. 1276, p. 184.
[2] Guthrie, Lancet, No. 1483, p. 114.
[3] Monthly Journal, March, 1847, p. 695.
[4] See on this subject Brit. and Foreign Med. Rev. Oct. 1842, p. 360.

of the Sac, Lond. 1833. Mayor, sur la Cure Radicale des Hernies, Paris, 1836. Lawrence, Treatise on Ruptures, Lond, 1838. O'Beirne on Defecation; also, on Strangulated Hernia, Dub. Journal of Med. Science, Sept. 1, 1838. Bransby Cooper, Guy's Hospital Reports, Oct. 1840. Reid on Diaphragmatic Hernia, Edin. Med. and Surg. Journal, 1840. Malgaigne, Leçons Cliniques sur les Hernies, &c., Paris, 1841. Thierry, des Diverses Méthodes Opératoires pour la Cure Radicale des Hernies, Paris, 1841. Luke, Med.-Chir. Trans. vol. xxvi. p. 159, Lond. 1843; also ibid. vol. xxxi. Teale on Hernia, Lond. 1846. Gay, on Femoral Rupture, &c. Lond. 1848. Hancock, Observations on the Operation for Strangulated Hernia, Lond. 1850. Hewett, Med.-Chir. Trans. vol. xxvii. Hilton, Med.-Chir. Trans. vol. xxxi. p. 323. [On the Construction and Efficacy of Trusses in the Radical Treatment of Hernia, see the Reports of a Committee appointed by the Philadelphia Medical Society, Am. Journal, vols. xvii. and xx.; also, a volume by Dr. Chase of this city. For a very good and condensed account of the various methods employed for the "Radical Cure of Inguinal Hernia," see Boylston Prize Essay for 1847, by Dr. Bryant, Boston, 1852; also Trans. Am. Med. Association, vol. v.—Ed.]

CHAPTER XXIX.

AFFECTIONS OF THE RECTUM.

Abscess Exterior to the Rectum.

Abscess in the areolar tissue exterior to the rectum is almost always of an acute character, and most frequently affects adolescents, or young adults of a weakly system. There are two distinct varieties, according to the site. One is quite external in the nates, early pointing outwards, attended with no great constitutional disturbance, not tending to burrow backwards on the bowel, and generally getting well under the simplest treatment. The other originates in a comparatively deep locality, by the side of the bowel, perhaps nearly two inches from the orifice. Pain, in the latter case, is great, and the constitutional disturbance severe; evacuation of the bowels is seriously impeded, and when attempted suffering is greatly increased; at first, no fluctuation is to be perceived, but hardness is felt on firm pressure with the finger by the side of the anus, and also when the finger is passed within the bowel; throbbing pain continues, the hardness enlarges, and ultimately a softening may be detected in its centre; matter forms rapidly and in quantity; it may gradually and painfully reach the surface; or, slow in its outward direction, the gut may give way by ulceration, and by this internal aperture the pus may be imperfectly discharged.

In treatment, our main object is to procure early and outward escape; attempts to prevent suppuration having previously failed. In the deep variety, the plunge of a bistoury, by the side of the bowel, so soon as softening has begun, is essential to prevent great constitutional disturbance and risk of the establishment of anal fistula. After evacuation, great attention to the general health will be required; inasmuch as without considerable improvement in the tone of system it will be found difficult to heal the wound, and equally difficult to prevent recurrence of the abscess. Not unfrequently a cachexy is met with, which baffles all remedial efforts—connected with phthisis of the lungs. In short, abscess exterior to the rectum is to be looked upon with suspicion, as regards both part and system—and treated accordingly.

Rectitis.

The inflammatory process affects the rectum not unfrequently; of idiopathic origin; or caused by external injury, lodgement of foreign matter, or exposure to cold; or connected with an excited state of he-

morrhoids; or an extension of inflammatory action from a contiguous part. In acute cases, the symptoms are very severe. The part is somewhat swollen, and most exquisitely painful; the sphincter acts spasmodically, and each movement of it aggravates pain to torture; intense burning heat is complained of; a scalding discharge passes away; or, in intense cases, the heat is at first dry as well as burning; the constitution suffers severely by fever. The urinary organs sympathize; there is painful micturition, and not unfrequently strangury or even actual retention occurs. The progress and results vary. Resolution may take place, with copious mucous discharge—perhaps with hemorrhage. Or the discharge is purulent, coming from the mucous coat; and resolution is both slow and incomplete. Or ulceration may take place; superficial and broad, limited to the mucous lining; or circumscribed and perforating, causing an aperture into the areolar tissue without, where fresh abscess forms, and fistula results. Or, the action proving of a minor but persistent nature, plastic exudation takes place in all the coats, but more especially beneath the mucous; and simple organic stricture is established.

Such being the risks of an advanced or obstinate inflammatory process in the rectum, treatment comes to be regarded as important; early and effectual, to anticipate evil. In the first instance, the cause is to be ascertained—and, if possible, removed; foreign bodies, for example, will be taken away, and ascarides expelled. The recumbent posture is enjoined, and blood taken away by leeching. No purgatives are given, but gentle enemata, if necessary. To allay spasm, and to soothe the sympathetic irritation under which the urinary organs generally suffer, opium is useful; in ordinary doses by the mouth; and largely applied to the part, in the form of inunction, enema, or suppository. Fomentation can scarcely be applied too hot or too sedulously.

Fistula in Ano.

By this is understood a fistula, or sinus (*Principles*, 3d Am. Ed. pp. 218, 220), by the side of the rectum; sometimes opening externally in the nates, but not communicating with the bowel, and then termed Blind External fistula; more frequently communicating with the bowel, but not yet opening externally, then termed Blind Internal fistula; usually having an aperture of discharge both externally and into the bowel, and then said to be Complete fistula. In the complete form—by far the most frequent—there is discharge of purulent matter by the fistulous track; flatus also escapes, and feculent matter. There is heat and much discomfort, often pain, increased by spasms of the sphincter; not unfrequently aggravations take place by recurrence of inflammatory action; and usually the general health is more or less undermined. Healing is prevented by at least three circumstances; the fistulous condition of the cavity and aperture—obviously unfavorable to contraction and consolidation; the frequent, almost constant, passage of foreign matters along the track; and frequent motion caused by the action of the levator and sphincter ani. The sinus may be monolocular or multilocular; that is, consisting of one simple track, or having more than

one collateral sinus connected with the main and original one—the minor probably the result of intercurrent inflammatory attacks. The cavity may be wide within; more frequently it is narrow—of the nature of true fistula; it may extend high above the sphincter, more frequently its end is within two inches of it. The internal opening—to be found in the great majority of cases—is invariably within easy reach of the finger; usually about an inch and a half from the orifice; of various dimensions, sometimes so small as not to admit the end of a common probe, but seldom if ever so large as to allow the passing of a finger's point; its size, circular form, and general character, denoting its origin to have been by perforating ulceration of the bowel.

Such perforating ulceration is the proximate cause of complete fistula; and it may come from without or from within. According to some authorities, the origin is always from within; rectitis produces perforation; through the aperture, feculent matter escapes into the areolar tissue without; abscess forms there, which, only partially discharged by the internal and original opening, ultimately gains the surface, on the nates, and is thence mainly evacuated. That such is the state of matters in many cases, there seems no reason to doubt. But it cannot be denied that not a few may and do follow a different course. Abscess begins in the external areolar tissue, idiopathic, or caused by injury, or following exposure to cold; it slowly advances outwards, at the same time burrowing by the side of the bowel. The matter may escape externally, while the bowel's coats are yet intact; constituting blind external fistula. Much more frequently, there is the internal opening too; of secondary formation, however, not primary—caused by pressure from without, and beginning in the peritoneal coat. And that this tunic is capable of taking the initiative in perforating ulcer, although less easily and more rarely than the mucous—even without so powerful an exciting cause as the pressure of an abscess—cases are not wanting to prove.[1]

Very frequently, fistula in ano is coexistent with pulmonary phthisis; probably caused by it, and constituting but one of the symptoms and signs of that intractable malady. The frequent cough of the invalid, causing straining on the bowel, and the tendency to mucous ulceration in the great gut—so favorable to production of the initiatory perforation—readily explain how the anal and pulmonary affections should not unfrequently be in close connection.

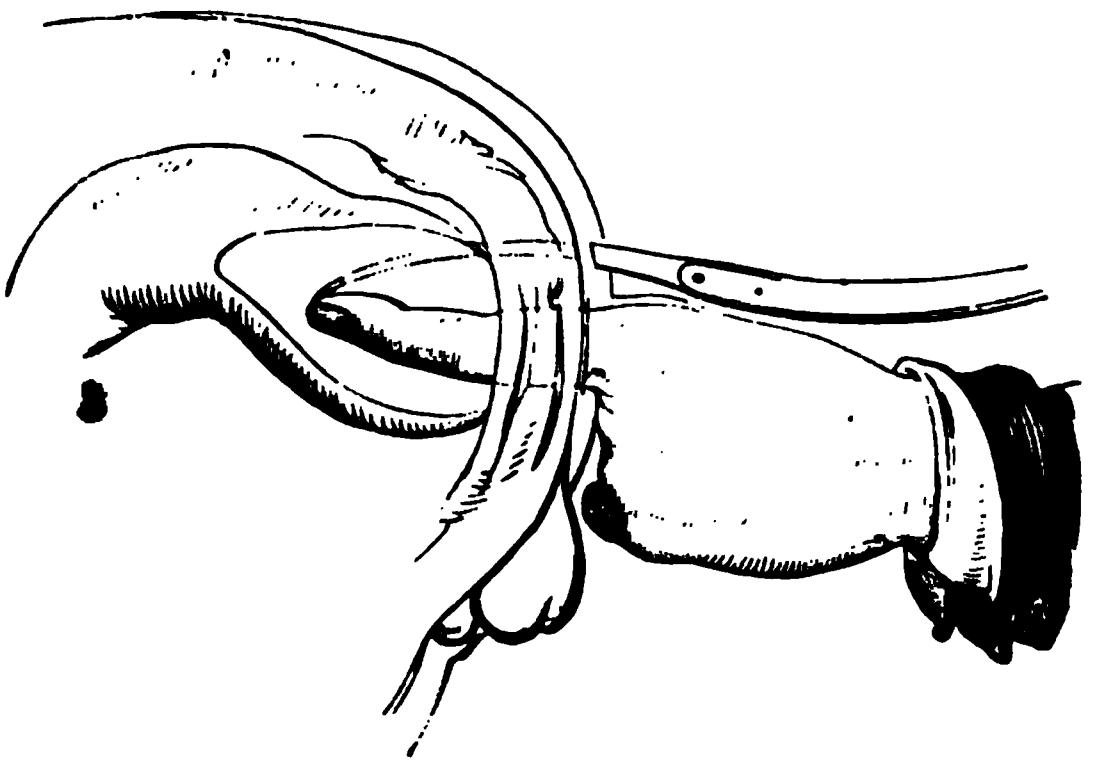
The history of fistula is not complete till careful examination has been made, by means of the probe and finger. The latter having been introduced into the bowel, the probe—with a broad and bulky termination to its handle, which renders it more obedient to the hand, and enables it to indicate with certainty the direction of the point when curved—is passed gently into the track, or tracks, so as to ascertain their number, position, and extent; but most especially to ascertain the exact position of the internal aperture—that is, on what aspect of the bowel it has formed, for, as already stated, it is as to height almost always close to the sphincter. In order to facilitate the entrance and movements of the probe, it is sometimes necessary to dilate the external

[1] London and Edinburgh Monthly Journal, January 1844, p. 40.

opening in the first instance. When there is no outward opening, the case being an example of the blind internal variety, there are usually plain enough indications of the site of the abscess—hardness, discoloration, pointing, &c.; and a plunge of a lancet or bistoury will at once change the case into the complete form. Or a probe, bent very much, may be introduced from the rectum into the internal opening; and by pushing the handle on the opposite nates, its points may be made to project on the affected side, and being felt there may be cut upon.

The treatment of fistula is simple—and, if the disease be merely local, usually quite effectual. The main obstacles to healing are the fistulous condition of the track, and the frequent motion by muscular action. By laying open the track, and at the same time dividing the sphincter, both are overcome. The patient is made to stoop over a bed or table, with the limbs unbent and somewhat apart; if anæsthesia be employed, he is recumbent with the legs raised. An assistant separates the nates to the full. The surgeon, seated, inserts the probe, taking especial care to lodge its extremity in the bowel through the ulcerated internal opening. The probe may be grooved, so as to admit of a curved, strong, probe-pointed bistoury being passed along it; or, the probe having been withdrawn, its place is occupied by the bistoury—used at first merely as a probe. The point is then met in the bowel by the fore-finger of the other hand—right or left, according to circumstances, for here ambidexterity is essential—and with the point pressing firmly on the finger, and with the edge moved in a gently sawing motion, both hands are brought down towards the operator, causing division of all that is within the concavity of the instrument. When this is of considerable thickness, or of almost cartilaginous density—as not unfrequently is the case—a particularly stout and well-tempered blade must be selected for the service, lest it give way. It is unnecessary,

Fig. 182.



Plan of the operation of Fistula in Ano, the finger and bistoury met in the rectum previously to division.

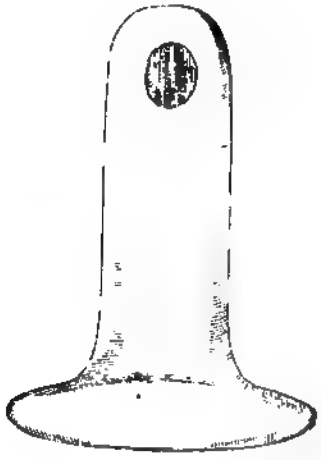
however, to divide any great extent of parts, for the following reasons: There is almost always an internal opening; this is invariably situate almost immediately within the sphincter; it is essential to make the line

of division pass through this aperture; but that having been done, there is in no case any necessity for passing the knife higher, however extensive the fistula may be. It is by no means uncommon to find the track passing higher than the internal opening; yet in these cases the ordinary operation is all that is necessary; the knife entering at the ulcerated opening, and no higher. One obvious advantage of this is, the avoidance of danger from loss of blood. A high wound might implicate arterial branches of considerable importance. In the approved operation, only small branches will spring; they are seen at the time of division, and can readily be secured by ligature, if need be—as, however, very seldom is the case. Should any superficial sinus exist, burrowing beneath the integuments, it should be laid freely open.

In the external form, in progress of formation by abscess originating in the areolar tissue, it has been proposed to evacuate the abscess, and then at once to complete the operation for fistula; hoping thus to save time and pain. It is better to evacuate, and delay; permitting the abscess to contract, and to degenerate into the condition of fistula; then operating for the cure of fistula. The wound is less painful and less extensive; and the result is at least equally satisfactory. Similar caution is advisable in cases of old standing, in which abscess has repeatedly formed around the anus with burrowing; it is well to evacuate and drain by opening and counter-opening, waiting till the suppurated space has contracted, and when much less extensive incision will consequently be required.

In the blind external form—that is, when we have searched carefully

[Fig. 183.]



[Fig. 183.—Anal Speculum, made of thick glass, silvered and blackened on the outside; closed at the upper end, with an aperture just below for the examination of the gut, and for local applications.

[Fig. 184.]

Fig. 184.—Another Instrument, made of similar materials; a part of the closed extremity cut off obliquely, to allow of inspection and topical applications being made. (From Fergusson).—Ed.]

for the internal opening, and found none—which will seldom be the case—the bistoury, having been passed to the usual site of opening.

has the edge of its point inclined towards the finger introduced within the bowel; by a gentle rubbing motion perforation is effected; and then the operation is completed in the usual way.

The use of the anal speculum may assist in detecting the internal opening. And when this is found, the speculum may be retained as an auxiliary in the operation; the parts yielding much more readily to the knife when put upon the stretch, than they are by lodgement of the open instrument.

Immediately after withdrawing the knife, bleeding is attended to. If an artery spring, it is tied; if there is oozing, at all formidable, pressure is applied by stuffing the wound moderately with lint. Usually, there is no necessity for any hemostatic; and it is enough to interpose a small portion of lint, or other dressing, between the lips of the wound, so as to prevent premature closure of the superficial part; our object plainly being, that the whole track shall inflame, granulate, and heal from the bottom. No cramming is necessary; slight dressing is sufficient.

Before operation, the bowels have been well cleared out by a purgative, aided by an enema if necessary. After the operation, a full opiate is given; to lull the pain, and at the same time, to prevent movement of the bowels—this not being contemplated for a day or two. At the end of the third or fourth day, a dose of castor-oil, or other simple and bland aperient, is given; and this, operating, brings away the contents of the rectum, including the dressing of the wound. Afterwards, it is enough to regulate the bowels; to make sure, by examination from time to time, that the wound is not closing prematurely, and that superficial sinuses are not forming; to attend to cleanliness; to apply water-dressing, by means of lint and oiled silk—retaining the dressing by a T bandage; afterwards medicating this dressing by ordinary stimulants, as the state of the granulating surface may require. For obvious reasons, a close regard is paid to the system throughout.

If fistula in ano coexist, with evident and advanced pulmonary phthisis, a question arises as to the propriety of operation. It may safely be answered in the negative. For, first, the operation will fail in its local effect; the wound, in all probability, will not heal. And secondly, supposing that it did heal, the result would probably be most injurious on the system; the pulmonary disease advancing with fresh virulence on the closing up of an outlet, whence purulent and other products had long been habitually discharged; in like manner, as the temporarily and locally successful amputation of a strumous joint, may have the effect of greatly shortening the phthisical patient's term of existence (*Principles*, 3d Am. Ed. p. 496).

Fissure and Ulcer of the Anus.

Fissures of the anus are extremely troublesome. They are most common in the adult; but no age is exempt; they have been observed in children at the breast. A chap or crack, analogous to what is observed on the lip, forms on the verge of the anus, in the mucous coat of the bowel; and is the seat of much pain, often of intense agony, more especially when the bowels are moved; then, too, spasm of the

sphincter adds greatly to discomfort. Sometimes, indeed, the muscle is found to be in a state of almost perpetual spasm; simulating most of the signs of stricture of the bowel; and the existence of the fissure may be obscured, in consequence of the obstacle which such spasm affords to ocular examination. In looking for fissure, the nates are forcibly separated by an assistant, and downward traction is made upon the anus with the fingers of the surgeon, the patient meanwhile straining steadily as if at stool. Sometimes the assistance of a speculum may even be required.

Almost invariably, this affection is found connected with previous disorder of the primæ viæ—perhaps a long-continued dyspepsia. And, in treatment, this circumstance has an important bearing. For, no local management can be expected to prove fully successful, unless the cause be taken away; that is, in most cases, the noxious matter lodging in the bowels must be removed, and the functions of the mucous lining must also be amended. In such cases, a cautious dose of calomel will probably be found the most suitable prescription at first; followed up, according to circumstances, by gentle aperients and alteratives. The part may be touched freely with nitrate of silver, or with the fluid nitrate of mercury; and relief of pain may be obtained by belladonna ointment, or by chloroform made into the form of ointment, or by hot poultices medicated strongly with opium in solution. Very frequently, however, such local treatment is resisted; and then a simple and slight operation is required. By means of the forefinger and a probe-pointed bistoury an incision is made through the mucous coat, including the fissure. And thus, the irritable sore is at once converted into a simple wound, which first inflames, and then heals in the usual manner. But, should this fail—as will not often be the case—the knife has again to be used; pressing it more deeply, the sphincter ani is divided; and the part, thus set at rest, quickly heals. Or, by subcutaneous puncture from without, the muscle may be divided, without interfering with the mucous membrane. To recapitulate; in all cases, great and primary care of the stomach and bowels is necessary; with this, some fissures heal under ordinary local treatment suitable to irritable sores; others require simple incision; and others, more obstinate, demand in addition division of the sphincter.

Ulcers of the mucous membrane of the anus are liable to assume the irritable character, and then are productive of the same distressful symptoms as fissure. They require, and are subject to, similar treatment. Situated more internally, they are not ordinarily visible, even on the most careful examination. The finger, cautiously introduced, may detect them by the peculiar feel which the ulcerated part conveys to the examiner, and by the great increase to the patient's suffering which is invariably produced by the finger's resting upon that part of the bowel. By means of the speculum their exact circumstances may be accurately surveyed. In those cases which evince no great irritability, tannin is often a most serviceable local application, in the form of ointment or suppository.

Immediately in front of the coccyx, that is, at the back part of the anus, a broad and deep ulcer, capable of receiving the finger's point,

is not unfrequently observed. For this, exposure by the speculum and the application of nitric acid, or nitrate of mercury, are usually necessary.

Hemorrhoids.

Hemorrhoids, or *Piles*, are divided into two kinds; external and internal. They seldom occur before puberty, and are perhaps more common in females than in males; certainly more troublesome to the higher than to the lower ranks of life. The predisposing causes are whatever tends to determine blood to the rectum, and to retard the return of blood from it; habitual constipation, pregnancy, abdominal tumors of any kind, torpor of the liver, sedentary avocations with luxurious living. And the exciting causes are whatever acts on the bowel itself excitingly, as purging, bilious diarrhœa, exposure to cold and wet, &c.

External piles are of but one structure; a congeries of varicose veins, surrounded by hypertrophied areolar tissue, and covered partly by mucous membrane, partly by loose rugous integument. They may be undergoing the inflammatory process, or they may be indolent and quiet. At one or more points, ulceration may have exposed their interior, and they bleed; or they may be *blind*, as the phrase is, emitting no blood. The varicose veins may have their normal fluid contents; or these, coagulated, may have caused condensation of the tumor, more or less complete. The tumor may be single; usually, more than one exists.

Treatment is either palliative or radical. The latter consists in removing the morbid formation, by scissors or bistoury, leaving the sore which remains to heal in the ordinary way. Palliation varies according to circumstances. If the part be inflaming, rest and the ordinary antiphlogistics are necessary. If it be in the indolent state, stimulants and astringents—iodine, galls, tannin, hellebore—are applied, with the view of puckering up the loose integument, obtaining discussion of the solid abnormal textures, and restoring the normal condition of the veins. The bowels are carefully regulated; and, for this purpose, sulphur is the favorite medicine, usually combined, in the form of electuary, with pepper confection; and sometimes, too, a proportion of copaiba is a good addition, dosed so as to avoid overaction, while it insures a daily and sufficient passage of a semifluid stool. By some, linseed oil, taken internally, is preferred as a soothing and safe laxative.[1] If any dyspeptic, or other disorder of the primæ viæ exist, that must be removed as speedily and thoroughly as possible. Very often the liver is to blame, and requires special treatment.

Not unfrequently, a small, recent, tense pile presents itself, acutely inflamed, and exquisitely painful. A simple proceeding not only affords present relief, but also may affect radical cure. With a lancet or bistoury it is to be laid freely open, throughout its entire extent; the coagulated

[1] Brit. and For. Rev. Oct. 1850, p. 553.

blood rolls out, a salutary loss of fluid blood takes place, and in subsequent healing of the wound consolidation is effected.

Internal piles are of different kinds: 1. They may be of similar structure with the external; varicose veins, surrounded by hypertrophied areolar tissue, and covered by mucous membrane more or less altered; open or blind; inflaming or indolent. 2. They may be genuine tumors, of the nature of simple sarcoma, more or less pendulous in their form. 3. They more frequently are of the nature of erectile tissue, this abnormal development having taken place in the submucous areolar tissue, as well as in the membrane itself. The tumor usually presents a broad base of attachment, and sometimes the surface resembles that of the strawberry.

Internal piles are most commonly of the last variety. If large and numerous, they may constantly protrude more or less from the anus, general relaxation of the mucous membrane of the rectum admitting of this. More frequently, they do not show themselves externally, except when the bowels are moved, and then the straining causes them to descend. If not replaced, they may become constricted by the sphincter and inflame. At each stool, it is common for blood to be lost, small arterial jets taking place from one or more points of the tumor, more especially if constricted. Usually, the patient gets into the habit of replacing the prolapsed tumors, after each evacuation; and, during the intervals, he may sustain no great inconvenience in the part. If the loss of blood, however, be habitual, even though but a small quantity escape at each time, the system is certain to give way under it, the patient becoming thin, weak, pale or sallow, dyspeptic, annoyed with tinnitus aurium, giddiness, and palpitations (*Principles*, 3d Am. Ed. p. 357). If the tumors are bulky, and often protruded, they are always in a more or less excited state; there are pain, swelling, heat, and discomfort, discharge of mucous and puriform fluid, and these, superadded to the effects of loss of blood, speedily undermine the frame. In extreme cases, the whole bowel is relaxed, and prolapsus ani accompanies and untowardly complicates the hemorrhoidal state. At any time, the inflammatory process may extend from the abnormal structure, and seize the bowel, producing rectitis, probably of an aggravated form. Thence abscess and fistula may result, or, under a minor degree of action, simple organic stricture may form. The urinary organs sympathize greatly during rectal excitement connected with piles, whether these be external or internal.

To allow such an affection to follow its own course, is thus seen to be dangerous to both part and system. Treatment is general and local, palliative and radical. The general treatment is to be pursued in all cases; regulating the bowels, looking to the liver, attending to regimen. Hemorrhage may be restrained by the internal exhibition of gallic acid, oil of turpentine, or other suitable astringent. If palliation only be intended, the local treatment will consist of careful reduction, after each evacuation of the bowel, and the occasional injection of some astringent fluid; such as solutions of rhatany, zinc, sulphate of iron, matico, oak-bark, or tannin; or the last-named remedy may be very conveniently and efficiently applied in the form of suppository. If excitement occur,

then come antiphlogistics, anodynes, and attention to the bladder. The radical treatment consists of removal by ligature. In the case of the solid genuine tumor, the knife may be used with impunity. But such formations constitute a small minority of internal piles. The overwhelming majority are vascular; and the great number of these consist of erectile tissue. To cut them out, were on each occasion to endanger life by hemorrhage; not only because the parts are vascular in themselves; but also because the interior of the rectum is favorable for continued oozing of blood, and ill adapted for the application of pressure or other direct hemostatics. Consequently, deligation is preferred.

The operation by ligature is thus accomplished. The patient having had the bowels freely open, is placed as for the treatment of fistula. By previous straining at stool—renewed at the time of operation, if necessary—the tumors are made to protrude to the full; an assistant separating the nates. If the form be at all pendulous, it is well to seize the fundus by means of a large volsella, and over this to apply a strong ligature, drawn very tightly around the neck of attachment. But if the base be broad, and the form of the swelling irregular, it is necessary to transfix the base by means of a stout needle; and, by tying separately the halves of the ligature, so to effect strangulation. Before tightening the second half of the knot, it is advisable to incise the livid fundus, permitting its fluid contents to escape; for then the noose can be tightened more thoroughly; and the tighter the constriction, the more rapid and less painful is the cure (*Principles*, 3d Am. Ed. p. 262 and 561). Deligation having been completed, the ends of the ligature are cut off close to each noose; and, by gentle manipulation the strangled parts are replaced within the sphincter. If an external hemorrhoid, or loose fold of skin be found, it is removed by the sweep of a knife or scissors; and if an arterial twig of any importance spring, it is at once secured by ligature.[1] A full dose of morphia is given, to lull pain and prevent motion of the bowels. The bladder is watched; and if strangury or threatened retention occur, warm fomentation is to be sedulously applied to the hypogastrium, along with the internal administration of henbane and sweet spirits of nitre, in small and repeated doses. By medicated poulticing, the pain in the anus may be somewhat assuaged. In a day or two, the sphacelated parts separate; and the remaining sore is treated as its circumstances may demand. Fetor is subdued by the chlorides. After cicatrization, nightly use of the tannin suppository is sometimes advisable, to promote and insure complete restoration of the normal caliber and tone of the bowel.

[The late Dr. Horner, of this city, introduced a modification of the ordinary operation for piles, to which he was very partial, and by which he supposed that much of the pain and all the danger from hemorrhage,

[1] This removal of loose skin is of great consequence, and should never be omitted; otherwise the anus remains lax, and predisposes to farther hemorrhoidal formation. Usually, there is a packet of rugous skin connected with each internal hemorrhoid; and the one is a very useful index of the other. Some surgeons think it sufficient to take away this outer defect, believing that the tight cicatrix will prevent reprotrusion, and that then the hemorrhoidally degenerated part will recover itself. But according to my experience, removal of both piles and skin is essential to a complete and permanent cure.

which sometimes attends the operation of the ligature, are obviated. It consists in drawing down the pile and making an incision around that portion of its base which is next the anus, so that the integument at the verge of the latter, just exterior to the mucous membrane, is divided. A wire ligature, looped through a canula, is then applied around the base of the tumor, and drawn sufficiently tight to strangulate it, which it does the more readily and with less pain, in consequence of the preliminary incision through the thickened and sensitive integument. (*Am. Journal*, vol. iv. N. S. 1842.)

The wire and canula are more commonly used in this city than the thread or silk ligature, and it is generally loosened and removed after twenty-four hours.—ED.]

As formerly stated (*Principles*, 3d Am. Ed. p. 732), anæsthesia may be used, without detriment to the facility or efficiency of the operation. And a subsequent minor use of chloroform is often of much service in assuaging the after pain.

In the slighter cases, nitric acid has of late been employed with advantage; when the tumors are small, recent, and composed of altered mucous membrane—investing slightly varicose veins, or perhaps only hypertrophied areolar tissue—the disease being mainly resident in the membrane itself. The parts, having been make to protrude, are rubbed over with strong nitric acid, so as to produce an eschar; and are then replaced within the sphincter, as in the case of deligation—carbonate of soda being freely applied so as to prevent unnecessary action of the escharotic. The eschar separates, removing the altered membrane; the sthenic suppurative action, which attends on cicatrization, would seem to act restoratively on the textures around; and the tightness of the cicatrix, when completed, may by its support prevent recurrence of varix beneath. By the potassa fusa, too, hemorrhoids may be very efficiently destroyed; the neighboring parts being carefully protected by use of vinegar.

Patients of greatly deranged livers are subject to general fulness in the lining membrane of the rectum, perhaps with one or more internal hemorrhoids, accompanied by a febrile state of system. In such cases, we are not to operate in any way, until the liver has been restored to a healthy or at least quiet state, and the general excitement has been calmed—otherwise the result might be serious, by aggravation of the internal and constitutional disorder.

In elderly, full-living patients, also, affected with disease of the heart, or showing a tendency to affection of the head, bleeding piles are not to be rashly interfered with; else the sudden cessation of discharge, and subsequent plethora, may entail the most calamitous results. The operation, if had recourse to at all, is not performed till after due preparation of the system. And the after treatment is conducted with much care and caution.

Similar precaution is requisite in the case of females, from whom blood escapes in large quantity and periodically, because vicarious. Such bleeding, however, is not always connected with piles. It may proceed from the lining membrane of the bowel, little if at all changed.

In advanced cases of bleeding piles, it is sometimes difficult to deter-

mine whether the *bruit*, palpitation, and other signs of diseased heart are primary or secondary, dependent on an organic cause, or merely on anæmia. Diagnosis in this respect, requires much caution; and when in doubt, we may lean to the side of operation, ready with leeches, seton, or other compensating treatment, should troublesome consequences threaten.

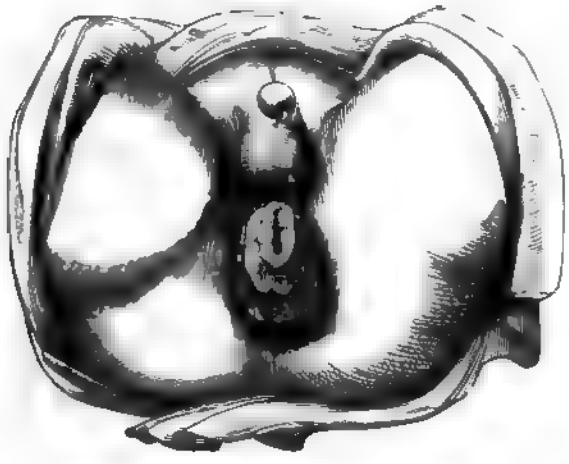
Polypus of the Rectum.

Simple polypi are occasionally, yet seldom, found in the rectum; most commonly in children; and then may be mistaken for prolapsus. In the adult, the fundus may become hard, rough, and ulcerated, and prove troublesome by bleeding. There is frequent desire to go to stool, with discharge, uneasiness, and occasionally pain and swelling. At each evacuation, the growth is apt to be protruded, and usually requires replacement. Treatment is removal, by knife or ligature. Obviously, the preferable method is by deligation; but, after the ligature has been secured on the neck of attachment, the main body may be safely cut away, in order to prevent tension and expedite the cure.

Prolapsus Ani.

In consequence of relaxation, the rectum may become everted, on straining, and protrude beyond the anus; and the protrusion may be either constant or occasional. Also, it may be either partial or com-

Fig. 186.



Prolapsus Ani.

plete; that is, the protrusion may consist of the entire bowel—or, as is by some supposed, of rather the sigmoid flexure of the colon; or it may be merely a descent of the mucous coat alone—a frequent concomitant, as has already been observed, of internal hemorrhoids. This partial prolapsus may occur at any age; and is probably most common in

the middle-aged; but the complete form is an affection almost peculiar to the two extremes of life; old age and childhood. The child is liable to irritation of the bowel, by ascarides, or by a perverted secretion from the general mucous coat; and the habitual straining, which results, tends to the change in question. In the old man, too, there is much straining; by reason of enlarged prostate, or debility of the muscular coat of the bladder. In the child there is much crying; in the old man much coughing. Stone and stricture may induce prolapsus at any age.

The tumor varies in size, from a mere annular border to the anus—as in the partial prolapsus—to a swelling as large as a child's head. The membrane, if habitually down and exposed, changes more and more to the cuticular character; much discharge takes place, of a reddish jelly-looking substance; inflammatory aggravations are liable to occur, causing much increase of distress; and, at any time, the existence of descent is accompanied with painful uneasiness in the part, and an oppressive general languor and debility—at least in the adult.

In the child, the affection may generally be removed by riddance of its cause. At the same time, care is taken to replace the protrusion after each descent; the bowels are duly regulated, and evacuation should always be made in the recumbent posture; crying should be avoided as much as possible; astringents may be used both outwardly and within—that is in the form of lotion, ointment, injection, or suppository; and iron or other tonics are usually indicated, on account of laxity of the general system. If protrusion have been neglected, and have attained a large size, some difficulty may be experienced in effecting replacement. Pressure is applied, as in the taxis for hernia; the parts having been previously lubricated. And it is well to make the reducing pressure chiefly during the straining or crying efforts of the patient, the verge of the anus then presenting a fixed point on which the reduction may be made. If the protruded part be found constricted, inflaming, and swollen, it is better not at once to attempt reduction; but, in the first instance, to diminish the bulk and inordinate action, by leeching, rest, and ordinary antiphlogistic means.

In the adult, there is the same necessity for removal of the cause, if possible; but cure seldom follows so simply. The same attention to replacement is to be enforced; and a pad may be worn, directly compressing the anus, so as to oppose reprotrusion. This pad—slightly conical in form, so as to fit into the anus—may be applied by means of the common T bandage; or, what is better, is adapted to a spring, as in the truss for hernia. Astringents are used, the bowels are regulated; and amendment, if not cure, is hoped for. It may be well, perhaps, to procure the daily stool at night; so that afterwards the long recumbency of bedtime may prove favorable in obviating the tendency to protrusion, which is greatest after functional excitement of the part.

Such is the palliative treatment. For a radical cure, other measures are required. One or more of the redundant folds of the mucous membrane may be removed, by knife or ligature; in the hope that the contraction of healing may sustain the replaced parts in their normal relation. But it is better, in most cases, while leaving the bowel

intact, to take away the redundant integument externally; hoping that the subsequently puckered cicatrix may effectually support the parts within, and prevent farther protrusion. This removal of skin may be by knife or scissors, or by actual cautery. The latter agent is perhaps unnecessarily severe; but, whichever is employed, the immediate pain may be safely abrogated by the use of chloroform. These means failing, another operation has been proposed; an abbreviation of the sphincter. By incision, a portion of this muscle is removed; and then the remainder having been brought together, and got to adhere, is expected to constitute a more active and effectual guardian of the mucous outlet. The success of this proceeding, however, has yet to be proved. And, in any such operation, especial care must be taken lest the task be overdone; and an unnatural tightness of the orifice result.

In the adult, accurate diagnosis is always important. Many a patient, during a long course of years, wears a painful truss for what is supposed to be prolapsus, but what is in truth mere looseness of the anal verge, with internal hemorrhoids—remediable, as we have seen, by a very simple operation.

Stricture of the Rectum.

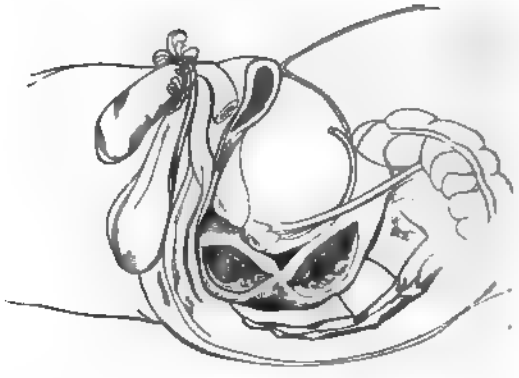
Contractions here, as in other mucous canals, are of three kinds: spasmodic, organic and simple, malignant. The *Spasmodic* does not frequently constitute a disease of itself; but is rather an accompaniment of some other affection—as hemorrhoids, fissure, or ulcer of the anus.

Its main symptoms are, painful tightness of the part, with difficulty and pain in voiding the feces. The site of constriction is at the orifice of the bowel; and the immediate cause is spasmodic action of the sphincter muscle. If it be but an attendant of another disease, removal of the latter will ordinarily suffice for cure. In the few cases of its single occurrence, treatment consists in rectifying the primæ viæ, which will invariably be found more or less deranged; and in the occasional use of a short bougie, of metal or caoutchouc, passed just within the sphincter, and retained for a few minutes on each occasion. An obstinate case may render division of the sphincter expedient; and in such circumstances the subcutaneous operation will probably be preferred. Belladonna may be used in the form of ointment.

Simple organic stricture is the result of a chronic Rectitis, as already stated. The constriction depends partly on condensation and thickening of the entire coats of the bowel; but mainly on deposit in the submucous areolar tissue. The ordinary site is about two inches from the orifice; and it is seldom indeed that this form of stricture is found beyond reach of the finger. The leading symptom is difficulty in defecation, with slimy discharge; the feces passing in a flattened and attenuated form, like tape, when solid, and when fluid being liable to forcible ejection as if from a syringe. Derangement of the digestive organs, with impairment of the general health, is induced; the abdomen becomes swollen, perhaps tympanitic; and the urinary organs are sympathetically involved. Above the stricture, dilatation takes place; and

there ulceration is apt to occur in the mucous membrane; greatly aggravating the distressful symptoms, perhaps inducing fistula—and, in the aged, not unlikely to degenerate into malignancy. From the obstructed state of the bowels, enteritic symptoms are not unlikely to arise; but, independently of sudden or casual aggravations, life is ultimately endangered by advancing emaciation and general disorder.

Fig. 186.



Rectum opened laterally; showing stricture of the bowel at the ordinary site.

Treatment consists in maintaining a gently open state of the bowels, mitigating the painful symptoms in the part and neighborhood by suitable remedies, and gradually obtaining dilatation of the bowel at the contracted part, by a cautious use of bougies; not failing to remember that the cure is not by mechanical dilatation, nor by inflammation, but by gradual absorption of the submucous abnormal deposit. The best form of this instrument is that made of elastic material, pliable, smooth, yet dense enough to resist circular compression. Having been introduced gently, it is retained so long as the feelings of the patient permit; and it is well that the lower part of the instrument should always be narrow, so as not to distend the sphincter and cause irritation. Or the bougie may be so formed as to lodge wholly within the bowel; an attached ligature or tape protruding, whereby it may be extracted. The portion of the instrument which is intended to pass and lodge in the stricture is gradually increased in size, until a full-sized bougie can be used without difficulty. Then dilatation may be deemed complete; yet, to insure against relapse, an instrument should be passed occasionally for some time afterwards.

Sometimes a tight callous stricture is found to resist the ordinary treatment. Then the knife's edge may be used with advantage; the surgeon slightly notching the contracted ring at many points, by means of a probe-pointed bistoury introduced on the finger; and afterwards proceeding with dilatation in the ordinary way.

Spasm of the anus may simulate organic stricture; and many of its symptoms also attend on enlargement of the prostate. Consequently, an accurate diagnosis can never be attained without careful examination.

By the frequent and forcible dejection of fluids, diarrhœa may be simulated; and a very erroneous treatment, by astringents, might be enforced, were examination of the part neglected. In most cases, the stricture is within reach of the finger; and in such there is no difficulty, the finger's exploration removing all doubt. Sometimes, however, the contraction is higher in the bowel; and then great caution is necessary in employing the exploratory bougie; for a fold of mucous membrane, or the natural promontory of the sacrum, in a healthy bowel, may obstruct the point of the instrument for a time, more especially if this be rashly and unskilfully introduced. By disreputable empirics, indeed, such obstruction is made use of as a means of deceiving healthy patients into a belief of the existence of stricture.

Malignant stricture, or *scirrho-contracted rectum* is, by no means, uncommon in the aged, and more especially in the female; supervening, usually, on some pre-existing affection of a simple kind, as piles, or simple stricture. The symptoms are such as attend ordinary contraction, with the addition of copious, bloody, fetid, puriform discharge; greater sympathy of the urinary organs; greater difficulty and pain in defecation; and the ordinary constitutional cachexy which attends and characterizes malignant disease. When the verge of the anus only is affected, the diseased parts may be removed by the knife. But if the disease extend some way up the bowel, as it usually does, we must content ourselves with palliation; assisting defecation by enemata and laxatives; and lulling pain by opiates, applied to both part and system. Death may take place by exhaustion; but, more frequently, the patient perishes under symptoms of ileus, the malignant deposit having advanced so as to cause complete occlusion of the bowel. Under such circumstances, the only hope of postponing death is by the formation of an artificial opening in the abdomen, for feculent evacuation; a very doubtful proceeding, as will afterwards be stated.

Medullary tumor sometimes forms between the bladder and rectum, causing great distress; interfering first with the functions of the rectum, and then with those of the bladder also. The treatment can only be palliative.

Irritable Rectum.

The lower bowel is liable to become the seat of irritation, unconnected with any structural change; causing pain, heat, itching, frequent desire to go to stool, spasm of the sphincter, and sympathy of the urinary organs. The source of irritation may be within the bowel itself, ascarides. Or it may be contiguous; stricture in the urethra, or stone in the bladder. Or it may be remote, yet continuous; a depraved state of the mucous membrane of the stomach or upper bowels. Treatment is obviously to be begun by removal of the cause, if possible. Afterwards, opium, hydrocyanic acid, or other calmatives, may be applied directly to the part, by means of injection, suppository, or inunction.

[Mr. Curling (*Treatise on Diseases of the Rectum*) recommends highly the local application of chloroform mixed with simple ointment, as a local anæsthetic in all the painful affections of the rectum. The

ointment which he advises contains ʒj–ʒij chloroform; ʒss oxide of zinc; ʒj olive oil, and ʒiv lard.—Ed.]

Itching of the Anus, an obstinate and distressing complaint—an irritation exterior to the bowel—is often the source of intense suffering to the patient. Generally, it is connected with a depraved state of the mucous membrane of the bowel; and removal of this, by the suitable alteratives—as tar, copaiba, arsenic, &c.—may suffice for cure. Sometimes it attends on piles or fissure; and is removed along with these ailments. Sometimes it is connected with a thickened and chapped state of the skin external to the anus; and in these cases, as well as in those where no local cause is apparent, applications to the part are essential. Of these the most successful are hydrocyanic acid, tobacco infusion, and camphor powder. The last may be used alone, or in combination with starch, and preceded by the application of a calomel ointment, ʒi–ʒi to the ounce.

[Dr. Physick pointed out, as a cause of the itching, and other symptoms of irritable anus, the transverse folds of the mucous membrane of the rectum, which act as pouches or sacs to catch and retain portions of fecal or other matters, in their progress along the bowel. These matters produce more or less nervous and vascular disturbance at the part, and even ulceration. These pouches were supposed by Dr. Horner to be normal and constant, giving trouble, however, only occasionally. Their existence may be easily determined by bending a probe, so as to form a hook, oiling it, introducing it into the rectum, and then partially withdrawing it; in this manner the whole circumference of the canal should be examined, and if any of the pouches should be thickened and distended, the end of the probe will catch in them.

The operation recommended and frequently performed by Dr. Physick, consists in drawing down the offending pouches with a bent probe, and slitting them with knife or scissors. Subsequently, injections of cold water, or astringent solutions should be employed; and a proper condition of the bowels should be maintained.

We must say, that we have seen these pouches slit open by the late Dr. Randolph, at the Pennsylvania Hospital, in cases of obstinate and severe itching of the anus, without the slightest benefit.—Ed.]

Hemorrhage from the Rectum.

Bleeding from the lower bowel is usually an indication of piles, as has been seen; of the internal, vascular pile, more especially; and is almost always arterial. In females, however, it not unfrequently is found independent of prominent alteration in the bowel; oozing from the lining membrane, merely congested; and then usually periodic and vicarious. Or it is frequent and exhausting, proceeding from a small vascular eminence on some part of the membrane, discernible only by the use of the speculum. The treatment is obvious; according to the cause. Hemorrhoids are to be tied. The uterine function is to be restored, and the general frame amended. The vascular point is to be cauterized; and astringents are at the same time given internally—the

best, perhaps, gallic acid. The tannin suppository may be used locally. In some way, the drain must be arrested (*Principles*, 3d Am. Ed. p. 357).

Injuries of the Rectum.

The anus is liable to wound and bruise, as other parts. The former may be formidable by hemorrhage; the latter by inflammatory action, leading to deep-seated abscess. Treatment is accordingly. A dangerous form of injury used to occur in hospitals, when the old-fashioned metallic syringe for giving enemata was recklessly used by ill-qualified administrators. The instrument's point pushed rudely upwards, in a straight direction, is likely to lacerate the bowel. It may perforate; and then the injection, perhaps stimulant and acrid, finds its way into the areolar tissue, causing extensive abscess, and sloughing, with violent constitutional disturbance. In such cases, the remedy is to make a free and early incision into the infiltrated parts. But the modern enema-syringe, intrusted only to trustworthy hands, is not likely to lead to any such casualty.

Feces and Foreign Bodies in the Rectum.

In the elderly of both sexes, but especially in the female, with whom irregularity of the bowels is more habitual, the feces may accumulate within the sphincter, forming a tumor of large size, and occupying not only the whole rectum, but also a portion of the sigmoid flexure. The symptoms are most distressing; painful fulness in the part, bearing down, frequent desire to go to stool, thin and scanty fluid passed, the bladder irritable, sleep disturbed, the stomach disordered, and more or less fever induced. Without examination, the affection may be mistaken for diarrhœa or dysentery; with an insufficient examination, the internal swelling may be supposed to be a malignant tumor. In cases of doubt, the finger's nail will bring away a sufficiency to test the nature of the concretion. In the milder cases, repeated injections of oil, followed by cathartic enemata, may suffice to clear the bowel. In the more confirmed examples, it is necessary to introduce the finger or fingers, with a lithotomy scoop, so as to break down the mass; afterwards clearing all away by injection. And two or more such operations may be necessary, at different times; as the higher accumulations may descend, only after removal of those which occupied the lower bowel. Afterwards it is obviously of much importance to secure regular movement of the bowels; with a view to avoid reaccumulation.

Foreign substances may lodge in the lower bowel; causing inflammation, abscess, and ulceration there, if not removed timeously. They may be pushed upwards from without, by accident, or by malicious design. Or they may be arrested by the sphincter in their progress downward, having entered by the mouth; as fish-bones, bones of poultry or other small animals, kernels of fruit, &c. Or they may have formed, within the alimentary canal, intestinal concretions. The smaller substances are readily removed by finger and forceps. Large bodies require

previous dilatation and lubrication of the bowel; and an exploratory use of the speculum may be useful. In extreme cases of impaction, it may be necessary to divide the sphincter. In the case of rough or sharp substances, whose forcible extraction in the ordinary way might seriously injure the bowel, a speculum is first carefully introduced past the foreign body, so as to sheathe and protect the mucous membrane.

Imperforate Anus.

Children are occasionally born with the anus closed. There are three kinds of this malformation. 1. The rectum may be fully developed, and have its orifice shut by integumentary membrane only; or the canal may be obstructed by a membranous septum, at some distance from the orifice—which latter may appear in all respects normal. 2. Or the bowel is imperfect; ending in a blind *cul-de-sac*, at some distance from the integument of the perineum, in which there is a mere depression or vestige marking where the anus ought to be. 3. Or the rectum is almost or altogether deficient; the sigmoid flexure of the colon terminating in a *cul-de-sac*, at the upper part of the pelvis.

The first form is easily managed. An incision is made through the occluding membrane; and for some days a piece of dressing is interposed, to prevent union. But often this precaution will be unnecessary; the passage of meconium and feces sufficing to keep the aperture patent.

The second variety is more common, and more troublesome. Some thickness of parts intervenes between the operator and the bowel. And at first the latter may be felt but obscurely, if at all; there being none of the bulging fluctuation which must soon be apparent in the former case. Under such circumstances, we wait until the meconium accumulates, and till the bowel in consequence descends and is distended. It may then afford some indication of its presence to the finger from without. To assist, let firm pressure be made in the left hypogastric region; and such pressure should also be maintained during the operation for relief. The cries of the child are of service. He is placed on the knee of a nurse or assistant, in a position as if for lithotomy. By means of a scalpel, an incision is made through the integument; and, by cautious dissection, the bulging *cul-de-sac* is sought for; the finger always preceding the point of the knife; the line of exploration following the natural curve of the bowel, in the hollow of the sacrum, lest the bladder or vagina should be wounded—not keeping too close upon the bone, lest the bowel be overpassed, and be mistaken for the bladder—and not diverging to either side, lest the pelvic bloodvessels sustain injury. The *cul-de-sac* having been reached, is opened freely; the meconium escapes; and the wound is to be kept pervious by the careful and patient use of tents—or, what is perhaps better, by the constant wearing, for some time, of a tube such as is used after lithotomy.

After even deep dissection, we may fail to meet the end of the bowel. Then it is quite warrantable to pass a trocar and canula upwards, cautiously, in the direction in which the bowel ought to be; and, on withdrawing the trocar, we may have the satisfaction of seeing meconium follow.

Sometimes the deficient rectum opens into the vagina or bladder; constituting a *cloaca;* irremediable.

Of the existence of the third variety we are made aware, when, after waiting for days, not even the slightest indication of bulging or fulness can be detected in the perineum. A perineal wound and exploration may be made; but with scarcely a hope of success. And, failing in this, we have either to abandon the patient to its fate, or proceed to the establishment of an artificial anus.

The Formation of an Artificial Anus.

The question of artificially establishing an outlet for the contents of the intestinal canal, elsewhere than in the normal site, comes to be entertained, when the rectum is congenitally deficient, and, also, when it has become in any way insuperably obstructed, by simple stricture, or by carcinomatous and extensive degeneration, or by the impaction of an intestinal concretion, or of some foreign substance from without. In the case of the child, probably the operation will seldom be deemed expedient; for when such a grave malformation exists—as entire deficiency of the bowel—others usually accompany it, rendering the viability of the patient, under any circumstances, very questionable. It were better to leave such to perish, by the original obstruction of the bowels, than to force on them a more miserable and scarcely less brief period of existence. In the case of malignant disease of the rectum, also, practitioners may well hesitate, before having recourse to a difficult and serious operation, for the purpose of attempting but partial and temporary relief, in an affection which must at no distant period end fatally. In such a case, it would seem to be warrantable only under the following circumstances; when the general strength is not yet greatly exhausted by malignant cachexy; when the obstruction in the bowel is complete, and plainly insuperable by any direct treatment; when the patient—having had the danger of the operation, and the almost disgusting result of its success, plainly exhibited—himself decides on its performance, and is prepared to abide both the nuisance and the risk. On the other hand, when the rectum is imperviously obstructed by the impaction of foreign matter from within or from without, or by disease not malignant nor necessarily and speedily fatal, and when such obstruction is otherwise insuperable—the expediency of the operation may be safely urged upon the patient.

The sigmoid flexure of the colon is plainly the part of the intestinal canal to be reached; and it may be sought, either from before or from behind. The former method, first proposed by M. Littré, is of easy performance; being merely a direct incision upon the part through the abdominal parietes and peritoneum, above the left groin. The operation, however, though most simple, is hazardous to life; and, if successful, the anus is inconveniently situated, in one respect, the patient being the victim of discomfort to himself as well as the source of annoyance to those around him. The site has its advantages, however, too. The operation is easy, and its steps certain; the anus, after a time, gets to possess something of a sphinctral power, from the muscular parietes;

and the offensive escape of its contents may be guarded against by wearing a well-fitted truss, the manipulation of which is easily within reach of the patient.

The posterior operation, proposed by Callisen, and greatly improved by Amussat, is performed thus: its object being to open the bowel on its posterior part, where it is uncovered by peritoneum, and which bare space may be expected to be considerable when the bowel is much distended by its contents. The patient is laid recumbent, with the trunk bent somewhat to the right side; and with a pillow also placed beneath the abdomen, so as to make the left loin prominent. A transverse incision is made, about four inches long in the adult, midway between the last false rib and the crest of the ilium; and, if any considerable obesity exist, the posterior part of the wound is crossed by a second incision, parallel to the range of the spinous processes. The different layers of fat, fascia, and muscle are carefully divided in succession, on the outside of the border of the sacro-lumbalis and longissimus dorsi; and portions of fat, coming much in the way, may require to be removed altogether. Intestine having been exposed, some doubt may be felt as to its being the colon or not; the bulging viscus at the bottom of the deep wound may be colon, or small intestine, or kidney. From the last, manipulation and percussion will readily enough distinguish intestine. And the great gut may be distinguished from the small, by attention to the following circumstances: the colon has its muscular fibres of greater development; the small intestines sustain a motion of alternate ascent and descent, communicated by the diaphragm, and corresponding to expiration and inspiration, while the colon is stationary, being fixed to the loins by areolar tissue; also, if two portions of bowel present themselves, that may naturally be expected to be the colon which is on the outer or spinal aspect, at the external border of the quadratus lumborum. Having become satisfied that the colon is exposed at the bottom of the wound, it is transfixed by a needle and ligature, at two points, above and below, so that it may not slip from its present relation to the wound, after an opening has been made and the contents have begun to escape. The bowel, stretched by the two ligatures drawn outwards, is divided freely between. Air and fluid contents at once pass outwards; but it may be necessary, by means of the finger, scoop, or forceps, to assist in extrusion of the solid matters. The margins of the opening in the bowel are then secured by ligature to the external wound, so that, by adhesion there, a permanent, safe, and efficient aperture may be constituted for fecal escape.

The advantages of this operation, in contrast with that of Littré, are. the peritoneum is uninjured, fecal escape is not so directly in the way of sight, and touch, and smell; there is less risk of prolapsus of the bowel, and control of evacuation is more complete; indeed, a complete sphincter seems to form in the loins, rendering the occasional exhibition of aperients necessary. The objections are, this new sphincter is apt to exceed its office, rendering dilatation or fresh incision requisite to maintain patency of the opening; and the site is not readily within reach of the patient, for managing the pad which requires to be worn carefully adjusted. Great cleanliness must be at all times observed.

[In an able paper, published in the thirty-fifth volume of the *Medico-Chir. Transactions*, entitled, "Case of Stricture of the Colon successfully treated by Operation, with an Analysis of Forty-four Cases of Artificial Anus," Mr. Cæsar H. Hawkins points out many facts of interest concerning the formation of an artificial anus, and deduces from his analysis many inferences which could hardly have been suspected *à priori*.

Of the forty-four cases, twenty-one died within the first five weeks, so that only twenty-three are considered to have recovered from the operation. Of the latter, however, one is rejected, the operation having been done for the cure of fistulæ in ano.

Of the twenty-two recoveries, five died within six months; at the end of a year, eight were either alive or left uncertain; nine only survived for about one year or upwards; one lived seventeen years.

As to the circumstances affecting the success of the operation, *sex* seems to have little influence.

Of forty-three patients, whose *ages* are given, eight were between twenty and thirty years old, of whom five died; four between thirty and forty, of whom one died; eleven between forty and fifty, of whom four died; ten between fifty and sixty, of whom seven died; seven between sixty and seventy, of whom two died; two reported as *adult*, of whom one died; one reported as *aged*, who died. Exactly half the patients, twenty-one, whose ages are recorded, were, therefore, from forty to sixty years old, of whom eleven died; while, from twenty to forty, there were twelve cases with six deaths. It seems, then, that, according to these tables, *age* does not exercise any special influence upon the result of the operation.

The nature of the disease for which the operation was practised, is thus stated: fifteen cases of stricture of the rectum and sigmoid flexure of colon, supposed non-cancerous; three, stricture of ascending or transverse colon, supposed non-cancerous; one, twist of upper part of ascending colon; one, adhesion of rectum to uterus from inflammation; one, strangulation of ileum by a band; one, fistulæ in ano; one, adhesion of ileum and rectum to cancerous uterus; seventeen cases of scirrhous rectum and sigmoid flexure of colon; one case of cancer of sigmoid flexure of colon, or of omentum; one, stricture of cæcum, with scirrhus of its coats from injury; two cases unknown; in all forty-four cases. Thus, of forty-two known cases, nineteen were cancerous; of these, sixteen had died at the date of this report; ten, however, recovered from the operation, and one lived rather more than two years after it. Of the twenty-one cases which did not recover from the operation, ten were cancerous. Yet it is not a little surprising that of the nine patients who alone lived for a year, three were cancerous. Mr. Hawkins remarks, in this connection, that "the more rapidly fatal cases of cancer of the intestinal canal are of the softer kind, in which obstruction is less likely to take place; and that the disease of the inner surface, frequently epithelial cancer, so often seen in the rectum, is less injurious to the general system than the softer carcinomatous affection of the intestinal canal." And again: "It appears, therefore, from the table, that an artificial anus, if required for cancer in the rectum or sigmoid flexure, affords nearly, though not

quite, as much chance of immediate success, and of subsequent prolongation of life, as when performed for all other obstructions not malignant." (P. 109.)

Mr. Hawkins doubts the frequency of cancerous stricture above the first five or six inches from the anus; according to his clinical and autopsical experience, "obstructions of the first five or six inches from the anus have been most frequently cancerous, or contracted cicatrices of ulcers; but almost all strictures above this height, which could fairly be said to be in the sigmoid flexure, so as to be scarcely if at all felt by the finger, have been firm, hard thickenings of all the coats of the bowels, generally of an annular shape, without evidence of carcinoma, even when more than one generation has been affected, as I have seen in three instances."

The *causes of death* in the tabulated cases were various. "Of the twenty-one operated on unsuccessfully, there are but two in which peritonitis is stated to have followed the operation without having been excited by the previous disease; and there is scarcely one in which the death of the patient is directly assigned to the operation; and I am inclined to believe," says Mr. Hawkins, "that the histories of the cases fairly justify the operators in attributing the fatal result to the previous effects of the disease itself on the constitution of the patients, or to the physical changes in the bowel. Hence we derive a strong argument for as early a performance of the operation as will be warranted by the immediate danger to life, either from the disease or from the operation, and by a fair estimate of the probable condition of the patient after recovery." (P. 111.) Yet the tables show one successful operation after thirty days' obstruction, and three after forty to fifty days' constipation; while others died after operation performed as early as the ninth or tenth day; thus showing that the urgency and frequency of previous attacks, and the severity of present symptoms, are more important elements in determining upon the operation than the mere duration of the obstruction.

Of the operations, twelve involved the peritoneum, twenty-six were posterior to this membrane; of the former, seven were unsuccessful; of the latter, only ten.

The *right* colon and cæcum were opened through the peritoneum in four cases, all of which died; and an artificial anus was made in the *right* colon behind the peritoneum in six cases, of which two died and four recovered; one of the latter living so long as three years.

The *left* colon had been opened through the peritoneum in eight cases, of which three died and five recovered; and of twenty cases of *lumbar* operation on the *left* colon, nine died and eleven recovered.

From the tables, Mr. Hawkins concludes that each operator, weighing the advantages and disadvantages of an artificial anus in front of the abdomen, and of one in the lumbar region, is, as yet, fairly justified in selecting whichever situation he thinks best on the left side of the body.—Ed.]

Copeland on the Principal Diseases of the Rectum and Anus, Lond. 1814. Howship, Practical Observations, &c. Lond. 1820. Ribes, Rechèrches sur la Situation de l'Orifice

Interne de la Fistule à l'Anus, &c. Revue Médicale, livr. i. p. 174, Paris, 1820. Calvert, Practical Treatise on Hemorrhoids, &c. Lond. 1824. Boyer, de la Fissure de l'Anus, &c. Paris, 1825. Bushe on the Malformations, Injuries, and Diseases of the Rectum and Anus, New York, 1827. Syme on Diseases of the Rectum, Edin. 1828. Salmon on Prolapsus of the Rectum, Lond. 1831. Dupuytren, Leçons Orales, Paris, 1831. Amussat, Mémoire sur la Possibilité d'Etablir un Anus Artificiel dans la Region Lombaire, &c. Paris, 1832. Brodie on Diseases of the Rectum, Lond. Med. Gazette, vol. xv. p. 845, 1835; ibid. vol. xviii. 1836. Houston on the Treatment of Internal Hemorrhoids by Nitric Acid, Dub. Med. Journal, March, 1843. Curling on Diseases of the Rectum, Lond. 1852. Morand, Collection de Plusieurs Observations Singulières des Corps Etrangers . . . dans le Fondement. Mém. de l'Acad. de Chirurg. vol. iii. p. 606. [Am. Cyclopedia of Medicine and Surgery, by Isaac Hays, M. D. Philad.; article, "Anus."—Ed.]

CHAPTER XXX.

CALCULOUS DISEASE.

Urinary Calculi.

HEALTHY urine is a straw-colored or amber-colored fluid, retaining all its elements in solution, with the exception of an almost infinitesimal quantity of mucus, which may in most cases be seen to subside after an hour or two from the transparent fluid, forming a very slight cloud at the bottom of the vessel. In various states of disease, on the contrary, the solid matters contained in the urine are apt to be precipitated, either in consequence of simple increase in their quantity relatively to the fluids, or from more complicated changes in the constitution of the secretion. Such solid precipitates, especially if composed of saline or crystalline matters, may give rise to distressing symptoms by causing in the urinary passages the formation of *gravel*, and of *stone* or *calculus;* the first term being applied to the finely granular form of deposit, the last two to solid concretions of more considerable size. A stone, once formed, has always a tendency to increase in size by new accretions of foreign matter upon its surface; and in consequence calculi, when they have acquired sufficient size to be detained within the bladder or kidney, generally give rise to symptoms of increasing severity, and may, sooner or later, require surgical interference for their removal. Hence the study of urinary deposits is important in a surgical point of view; although the constitutional conditions which lead to them fall, for the most part, within the province of the physician, like the other derangements of the urinary secretion. These conditions are commonly called *diatheses*, and may be detected either by the occasional presence of gravelly deposit in the urine, or by such changes in its chemical constitution, as are known to give a tendency to precipitation. The existence of any abnormal irritation in the urinary organs, should therefore in all cases lead to an examination of the urine, and particularly to careful observation of its sediments, if present, with a view to ascertaining and correcting any calculous tendency. Here, as in all other cases, prevention is better than cure.

The means necessary for the examination of urine in relation to surgical disease, are—a good microscope with a magnifying power of at least 200 diameters, a urinometer for testing specific gravity, test-tubes, test-papers, and a few simple chemicals which will be mentioned immediately. By the conjoint employment of the microscope and of chemical analysis, after the manner so fully described of late years by

Dr. Golding Bird and others, it is now within the power of every practitioner to detect even the earliest traces of calculous tendency; and no one can now be excused for overlooking derangements of the urine, which a few years ago would inevitably have been allowed to proceed unchecked, until they ended in calculous formation, or at least in the minor evil of gravel.

The normal urinary secretion usually yields, as above mentioned, a slight hazy cloud of mucous sediment, which forms its only precipitate in the state of absolute health. This cloud of mucus presents under the microscope only a very few rounded bodies, resembling closely the cells found in pus, and occasionally traces of epithelium-cells from the bladder or some other part of the passages. Often, however, these are absent, or nearly so, and the sediment is altogether impalpable; occasionally, on the other hand, the so-called mucous corpuscles are increased in number, and the mucous cloud which contains them is increased in bulk and opacity. This is the first grade of mucous irritation, and is often found in connection with various kinds of saline deposit. Under a farther progress of this condition the urine may become highly impregnated with mucus and epithelium; or the mucous cloud may be supplanted by a distinct deposit of pus.

To the test-paper, healthy urine presents a tolerably distinct acid reaction; this may be feeble, or the urine may even be occasionally neutral, without the presence of any serious derangement; but any degree of persistent alkalinity must be regarded as distinctly abnormal, and requires correction by treatment, unless in the case of its having been induced by medicine or accidental dietetic conditions, which sometimes render the urine temporarily alkaline. According to Dr. Bence Jones, the acidity of the urine undergoes constant changes in amount in healthy persons, according to the condition of digestion; being invariably greatest immediately before meals, and falling to its minimum a few hours after breakfast and dinner; appearing, therefore, to stand in an inverse relation to the acidity of the stomach. The source of the acid reaction of urine is not known with certainty; it is supposed to be owing not to any free acid, but to the presence of some salt, such as the acid phosphate of soda.

The specific gravity of the urine, and the proportion of solid matter contained in it, are likewise subject to considerable variation at different periods. After a meal and towards the close of digestion, the density of the urine (which has been called in these circumstances *urina chyli*) becomes greatest, and may exceed 1030, as tested by the urinometer. After drinking largely, on the other hand (*urina potus*), it may be reduced almost to the density of water; while the urine passed in the morning (*urina sanguinis*), independently of the influence of food or drink, has usually a specific gravity of from 1015 to 1025. The absolute quantity of urine passed in twenty-four hours varies, as might be expected, with the amount of drink; and has an inverse relation to the specific gravity, which is commonly high in proportion as the urine is scanty. About a quart (forty ounces) of urine may be assumed as an average quantity for an adult.

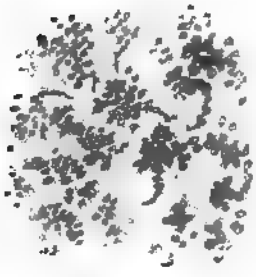
The principal sediments occurring in the urine and tending to the formation of calculi are as follows:—

1. Deposits of free uric acid, or urates of ammonia, lime, magnesia, and soda (*Lithi-uria*); 2. Deposits of oxalate of lime (*Oxal-uria*); 3. Earthy phosphatic deposits, consisting of phosphoric acid, with lime, magnesia, and ammonia (*Phosphuria*); 4. Deposits of a peculiar organic crystalline matter, termed cystin (*Cystinuria*); 5. Deposits of another organic principle, scarcely crystalline, the uric oxide or xanthic oxide of Marcet (*Xanthi-uria*). Fibrine, carbonate of lime, and silica have also been mentioned as ingredients of calculi; but the deposition of these substances from the urine is extremely rare, and does not appear to have been the result of any peculiar morbid diathesis or tendency, the knowledge of which can be of any important use to the practitioner.

The Lithic or Uric Deposit.—This consists either of the uric acid, or of the urates, tinged with coloring matter; and varies accordingly: 1. The most common is *amorphous;* consisting chiefly of the urate of ammonia, more or less colored; of a yellow hue, when mixed with the coloring matter of the urine; reddish, like brick-dust, when combined with the purpurate of ammonia; and when this latter ingredient is in much abundance, the sediment is of a pink color. Such urine is unusually acid, when tested; is of high density; and has a small relative proportion of aqueous matter. When passed, it is clear; but, on cooling, the sediment is deposited more or less abundantly. 2. The *crystalline;* consisting of uric acid, variously tinged by admixture of coloring matter; usually of a reddish hue—the crystals resembling particles of cayenne pepper; and constituting the most ordinary form of gravel or red sand.

Examined under the microscope the amphorous deposit, or brick-dust sediment, appears either in the form of exceedingly minute molecules, sometimes aggregated together, sometimes dispersed over the field; or in that of larger globular masses, semi-opaque, brownish in color, and sometimes either grouped together or armed with projecting spiculæ like stalactites. The last form is unusual, and has been considered by some observers as urate of soda. The crystalline deposit of uric acid assumes generally the form of rhombic prisms, but appears in various modifications of this primary type; the most usual is that in which the rhomboids or lozenges are very thick and rounded at the angles, so as to resemble, when placed upon their sides, thick cylinders, for which they may readily be mistaken, especially if grouped together in masses, as frequently occurs. The uric acid crystals are generally colored, and have, under the microscope, a peculiar deep amber tint, which is highly characteristic.

Fig. 187.



Urate of Ammonia under the microscope.

All the deposits of either free or combined uric acid are highly soluble in caustic potash; in soda, they are less so. The urate of ammonia, which forms the principal part of the amorphous deposit, is tolerably soluble in water at the temperature of the body; and hence is seldom

deposited except on cooling of the urine after excretion. In some cases, however, especially when the urine contains an excess of acid, the urate of ammonia is deposited within the bladder. The uric acid deposit, on the contrary, which is thrown down by the addition of almost any acid to urine holding urate of ammonia in solution, is soluble only to a very slight extent in water, even with the aid of heat; and hence is a comparatively frequent deposit in the urine on emission, although much less common than the amorphous sediment as a result of cooling. Both deposits are decomposed by strong nitric acid with the aid of heat, and leave on evaporation a beautiful lake-colored residue, which becomes purple in tint by the addition of ammonia (purpurate of ammonia, murexide). Urine containing these sediments is usually rather high-colored, of good or excessive specific gravity, highly acid, and often scanty. Not unfrequently the amorphous deposit is not the result of any derangement of the system, but merely arises from deficiency of drink or abundant perspiration. This is never the case with the uric acid or crystalline sediment.

Fig. 168.

Crystals of Uric Acid.

Uric deposits may attend the slightest derangement of health, or the most serious; they denote a sthenic state of system, more frequently than the opposite condition. A trifling disorder of digestion, as by casual error in diet, may cause a tolerably copious sediment; the progress of hectic, and the decline of inflammatory fever, are accompanied by plentiful deposit of red powder—termed *lateritious*, from its resemblance to brick-dust. The gouty diathesis is marked by uric deposit. Habitual indulgence in much animal food, with deficiency of exercise, and neglect to maintain a clean and efficient state of the skin, will not fail to establish it. It is obviously connected with climate—at least with locality; the inhabitants of certain places suffering much more than others. It is also connected with age; prevailing most in childhood, and between the ages of forty and sixty. It is hereditary. It may follow injury of the kidney or its neighborhood; congestion being produced in the secreting organ. It would seem to depend proximately, either on an excess of uric acid being generated in the system—by decay of the effete organism, or by mal-digestion of food; or on the presence of a free acid—the muriatic, acetic, or lactic—which, combining with the base, frees the uric acid and so leads to its precipitation. Or the causes

may be stated in another way, as by Dr. G. Bird: 1. Waste of tissues more rapid than the supply; as in fever, rheumatism, &c. 2. Supply of nitrogen in the food, greater than is required for the reparation of tissues; as by excessive indulgence in animal food, and by too little exercise. 3. Digestion insufficient to assimilate an ordinary and normal supply of food; as in dyspepsia. 4. Obstruction to the cutaneous outlet for nitrogenized excretion; by skin diseases, or other cause. 6. Congestion of the kidneys; following injury of the organs, or disease wherein they are affected by sympathy.

Plainly, the treatment must vary according to the cause. In the fevers already mentioned, the deposit ceases as the constitutional symptoms subside. In other cases, the treatment may be said to be twofold. By the exhibition of alkalies, with which the uric acid combines, soluble salts are formed, while at the same time—mainly perhaps by the vehicle in which the alkali is given—the aqueous portion of the urine is increased. And by attention to regimen, exercise, and the skin—going more deeply into the matter—we seek to rectify the depraved state of the digestive organs, on which the evil in the great majority of cases primarily depends. Both methods are of service, but the latter is obviously the more important; they are usually combined. Magnesia, soda, and potass may be given. The first may accumulate in the intestines; and on this account is seldom prescribed, at least for any length of time. The phosphate of soda is both safe and useful. The carbonate is grateful, and quite efficient. But potass is usually preferred; its urate being more soluble than that of soda. The bicarbonate is usually given, in half-drachm doses, largely diluted; and it may be pleasantly combined with a few grains of citric acid. The best period for administration, probably, is about two hours after the principal meals—when alkalies are most wanted to neutralize the free acid of indigestion; and when at the same time digestion is so far advanced as to render it unlikely that this process shall be interfered with by the alkali. There are also the borate, citrate, and tartrate of potass—all available.

Simple though the alkaline remedies seem, let them never be persevered with carelessly. Their over-sustained use may convert the sthenic state of system into the asthenic, inducing serious constitutional disorder, and causing an ammoniacal and phosphatic state of the urine. The test-paper must be used from time to time, and the state of the system must be carefully attended to.

In those cases in which digestion is obviously weak and imperfect, preparations of iron are useful; the citrate, in solution, may be given in moderate doses after each meal. Regimen is carefully attended to; food being regulated as to both quantity and quality. Nothing at all approaching to a surfeit should ever be indulged in; animal food should be taken sparingly, if at all; vegetables and farinaceous articles may be freely used, provided acidity be not produced; malt liquors should be abstained from; and wine, if taken at all, must be used with great moderation. The bowels require laxatives or alteratives. In most cases, a mercurial purge is a good beginning of the treatment; and, if the sthenic constitutional symptoms amount to a febrile character, cupping may be also practised on the loins. The skin must be attended to;

by ablution, warm clothing, friction, and exercise; and if any eruption exist, means must be taken to remedy that. Occasionally, gentle diuretics would seem to be of service. Colchicum, it is well known, is a powerful eliminator of uric acid; and hence, probably, the main reason of its success in gout and rheumatism. When congestion of the kidney is suspected, the treatment is by cupping, rest, and antiphlogistic regimen.

The term "*gravel*" is ordinarily applied to the passing of the uric acid deposit. It begins severely, and is liable to aggravations; and these periods of intensity are termed "fits of the gravel"—characterized by pain in the lumbar region, shooting down towards the groin, with pain and retraction of the testicle; frequent micturition, hot and scalding; uneasy sensations in the thighs, very frequently; more or less febrile disturbance; and always plain indications of great derangement of the digestive organs. It is in such cases that purging, antiphlogistic regimen, and sometimes local bloodletting, form so excellent a commencement to the remedial means.

The ordinary treatment may be reduced to the following indications: 1. To diminish the uric formation; by moderate antiphlogistics; regulation of diet and exercise; and attention to the skin. 2. To increase the solvent power of the urine; by diluents, given cold—yet not so as to discourage perspiration; and by gentle diuretics, if necessary. 3. To increase the solubility of the deposit; by preventing or neutralizing the free acid, which, spoliative of the urate's base, causes precipitation of the uric acid; and by presenting an alkali as a soluble base to the uric acid. 4. The fourth indication is one of no slight importance—to favor extrusion of the gravel; by diuretics and diluents; by warm bathing; and by exercise. And in regard to this, it is well to remember that the particles of uric gravel are especially prone to aggregation.

The Oxalate of Lime Deposit.—The occurrence of oxalate of lime in the urine as a source of calculus has been long known; but the frequency of this deposit was much underrated, until the careful researches of Dr. Golding Bird, who first investigated the form of its microscopic crystallization, and the symptoms connected with its occurrence in the early stages. It constitutes a species of very minute crystalline gravel which readily escapes observation by the naked eye, in consequence of the perfect transparency and absence of color in the crystals. On careful observation, however, they may often be seen as minute glistening points floating in the urine, which usually contains a slight excess of mucus, but is often nearly or absolutely clear.

The crystals are probably precipitated within the organism in most instances; they may, however, be absent from the urine on emission, and be found in great abundance twenty-four hours afterwards. The mode in which they are retained in solution is not known, as the oxalate of lime is exceedingly insoluble in water.

With the exception of a rather high specific gravity, which is usual, there is nothing very characteristic in the appearance of urine containing oxalate of lime. The amount of urea is generally large; often, also, uric acid and its salts are in excess, and sometimes they form de-

posits which coexist or alternate with those of the oxalate. The earthy phosphates are likewise usually in excess in oxaluria, but are held in solution in consequence of the acidity of the secretion. The color of the urine varies from a pale straw-color to an amber tint, the latter being perhaps more common and characteristic. The urine in this disease generally, as already mentioned, deposits an excess of mucus; and along with this there are sometimes found minute quantities of seminal fluid, as indicated by the presence of spermatozoa under the microscope.

The most usual form of the oxalate of lime as seen under the microscope is that of octohedral crystals, generally not more than $\frac{1}{1500}$ or $\frac{1}{2000}$ of an inch in diameter, and often much less than this; always perfectly transparent, colorless, and exceedingly sharp and well defined in their angles. Occasionally, the crystals are "made up of a square prism, with a four-sided pyramid at each end, forming a dodecahedron." Another form much more rare, and possibly not composed simply of oxalate of lime, is that of dumb-bell shaped or oval crystals, often resembling "two kidneys with their concavities opposed," and possessing a beautiful radiating structure in some cases, while in others they appear homogeneous. The crystals are insoluble in alkalies or in vegetable acids; soluble in muriatic and nitric acid; and on being subjected to a red heat are decomposed, leaving carbonate of lime, which dissolves with effervescence on the addition of acids. In regard to the pathological or physiological origin of oxalate of lime in the economy, many speculations exist; but none of them are sufficiently precise or well founded to claim attention in a practical work. It is very probable that this deposit has some relation to the decomposition of the tissues, and is formed at the expense of urea or uric acid.

Fig. 189.

Oxalate of Lime under the microscope.

The attendant constitutional symptoms are occasionally slight; commonly, however, they are sufficiently characteristic and distressing to require attention and treatment. The patient is languid, weak, and thin; often remarkably depressed in spirits; usually pale, sometimes of a greenish hue in the face—more especially about the eyes and mouth; pustular formations on the skin are common; and so are scaly eruptions; the slightest exertion induces great fatigue; the temper is irritable; the mind broods over the ailment, and desponds of recovery: dyspepsia is present—troublesome, by flatulence and palpitation, more especially after taking food; aching pain is complained of across the loins; and the sexual power is usually much impaired. Sometimes the symptoms of phthisis are simulated; sometimes those of heart disease. Not unfrequently, water is made with unusual frequency, and with heat and smarting.

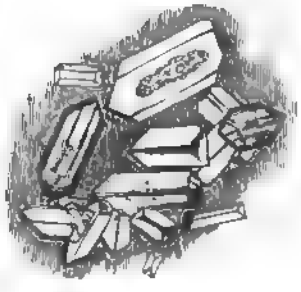
The ordinary causes of this affection are, over-exertion of mind or body, excess of venereal indulgence, habitual and gross errors of diet, exposure to cold, injuries done to the lower part of the spine. The

oxalic acid would seem to be the product of faulty assimilation; and it readily meets with its base. According to some, the acid may be introduced from without; it being supposed to be one of those substances which are capable of passing unchanged from the stomach to the kidneys. According to this view, the taking of rhubarb, sorrel, tomata, &c. as articles of food, along with the use of hard water as drink, may be deemed very favorable for the establishment of the oxalate of lime deposit.

The treatment resembles that for the phosphatic diathesis. The general functions are looked to; but more especially those of the stomach and skin. Diet is light and nourishing. Malt liquor is forbidden; and a sparing allowance of brandy and water, with meals, is found preferable to wine. Sugar is abstained from. Warm clothing must be worn; and by friction, exercise, and warm bathing, the pores are to be kept free. All sources of exhaustion, and all kinds of depletion are to be avoided. Medicinally, the mineral acids are found of much service; especially the nitro-muriatic, exhibited in some bitter infusion. And, of the tonics, zinc and iron are to be preferred; the sulphate of zinc more especially. Colchicum, too, may be found useful. It is well to remember that, in treatment, the oxalic often changes into the uric diathesis; indeed, it is probable that these two morbid states readily pass into each other—it costing the urea, as it were, but little effort to change into either the uric or the oxalic acids. When, under treatment, the uric deposit is observed to succeed the oxalic, the use of the acids must be abstained from, at least for a time.

The Phosphatic Deposit.—Normal urine contains a considerable proportion of phosphoric acid, the greater part of which is in combination with alkaline bases, and forms salts which are highly soluble. The phosphates of lime and magnesia exist also in small but very variable quantity, and are held in solution, probably by the acid of the urine, along with some of its saline constituents. These earthy phosphates are in greatest quantity after a meal, in healthy persons; and in various diseases, especially those attended with emaciation, appear to increase in amount. They are precipitated and form a slight cloudiness in the urine, on the addition of any caustic alkali or alkaline carbonate; and when healthy urine passes into the state of decomposition, the earthy phosphates are also thrown down, owing to the evolution of carbonate of ammonia from decomposing urea. The precipitate may be either amorphous or crystalline. The former generally consists of phosphate of lime; the other of the triple phosphate of ammonia and magnesia. This last, in a nearly neutral urine, crystallizes in triangular prisms bevelled at one or both ends, exceedingly transparent and colorless, like the prisms of crystals used in optical experiments. These crystals are very friable, and are consequently often observed irregularly

Fig. 190.



Crystals of the Ammoniaco-magnesian Phosphate.

splintered, or shivered into small fragments; they are always perfectly colorless, and by this character are easily distinguished from uric acid. In a highly alkaline urine (whether spontaneously alkaline or decomposed after emission), the phosphate of ammonia and magnesia occurs under a variety of crystalline forms, corresponding to the basic varieties of the salt. "When rapidly formed, this salt generally appears in the form of six-rayed stars, each ray being serrated, or irregularly crenate, often runcinate, like the leaf of the taraxacum." There are, however, many varieties of star-shaped and foliaceous crystals, consisting of basic triple phosphate; and generally these are mixed with the neutral salt in the ordinary prismatic form above described. All the forms may be readily produced artificially, by adding ammonia or its carbonate in different quantities to the urine.

The phosphatic gravel is usually white or pale gray, whether amorphous or crystalline; it may be precipitated in the form of plain gravel, or it may be either suspended or precipitated in a cloud resembling that of mucus, or it may form as a pellicle on the surface of the urine. The urine is pale and copious, of low density, occasionally alkalescent, when voided; never more than very faintly acid, often turbid, the last portion which is voided presenting a milky appearance, the phosphates being already precipitated; sometimes it emits a heavy, sickening flavor, somewhat similar to that of weak broth; not unfrequently it is ammoniacal from the first, dark-colored, and loaded with mucus; in all cases, it very soon putrefies, precipitating the deposit copiously, and exhaling a very offensive odor. Very generally, an iridescent pellicle forms on its surface, consisting of minute shining crystals of the ammoniaco-magnesian phosphate.

The symptoms which attend the continuance of phosphatic deposit, are invariably of the asthenic type. The patient is pale, weak, nervous, irritable, incapable of sustained exertion of either body or mind; the bowels are flatulent and irregular, and an oppressive, exhausting pain, or aching, is almost constantly complained of in the loins.

The cause may be local or constitutional. Whatever tends to exhaust the general, and more especially the nervous system, tends to induce this deposit—over-exertion, especially of mind, insufficient food, the habitual use of depressing medicines, as mercury, alkalies, saline purgatives. Also, this deposit is a frequent consequence of injured kidney, and of injury to the spine, and it is an almost invariable attendant on confirmed disease, more especially if organic, in the bladder, kidney, ureter, or prostate. An occasional deposit of phosphates may follow a slight and transient cause, as error in diet, or profuse perspiration under violent exercise. But continuance invariably denotes broken health. The least formidable cases are those in which the ammoniaco-magnesian phosphate alone is found, and the worst are usually those in which the deposit consists of a combination of this salt with the phosphate of lime.

Happily, the phosphatic gravel is not prone to agglomerate within the bladder, unless a nucleus be present; then, however, the cohesion of particles, around this, takes place rapidly.

In treatment, as in that of the uric deposit, we have to direct attention both to the deposit, and to the causes which lead to its formation. The

mineral acids, as the muriatic, nitric, or a combination of both, exert a double influence; they increase the solubility of the phosphates, and at the same time give tone to the primæ viæ and general system. They are given in doses of a few drops, much diluted, and gradually increased. Regimen is carefully attended to. Food should be generous, yet light and moderate, consisting chiefly of solids. Acescent vegetables, fruits, and drinks are injurious, for, however useful the mineral acids, taken from without, may be, acids engendered within invariably betoken derangement of stomach, and that as invariably reacts most untowardly on the urinary organs. Wine may be taken sparingly. Over-exertion in any way is avoided, free air and laxity of occupation are to be sought, and the skin's function must be well looked to. The bowels are regulated, but mercury and saline purges do harm. Diuretics are not given, neither are alkalies, unless indeed the acids of indigestion plainly are troublesome, and then very small and occasional doses of alkali may be of service. Depletion, in any way, is not to be thought of. Opium is of much service, by subduing the irritability of system. General tonics are plainly indicated. And the decoctions of the diosma crenata, pareira brava, and uva ursi, would seem to exert a beneficial influence specially on the urinary system.

The Cystine or Cystic Oxide Deposit.—This deposit is rare, but as it causes one of the most obstinate forms of the calculous diathesis, it is necessary to mention it here. Cystine is always crystalline, though to the naked eye it scarcely appears so, having more resemblance to the paler forms of lithate of ammonia. It forms a yellowish sediment, insoluble by heat, unaffected by vegetable acids, but dissolved by strong mineral acids and alkalies. Ammonia dissolves it very readily, and on evaporation deposits it unchanged in the crystalline form. Under the microscope, cystine appears in the form of hexagonal plates, often overlapping each other so as to form rather a confused mass. The ammoniacal solution, slowly evaporated, gives crystals which can usually be distinguished from all others without difficulty.

Urine containing cystine is usually of a more or less deep yellow color, sometimes inclining to green. Dr. Golding Bird has even seen it grass-green. Its odor is either aromatic like that of sweetbrier, or slightly

Fig. 191.

Crystals of Cystine.

fetid. The quantity of urea and of uric acid has generally been found below the average; and it is not improbable, from the chemical relations of cystine, that it is formed at the expense of these physiological pro-

ducts. Cystine contains a large proportion of sulphur (26 per cent.), and is therefore probably in some way related to the sulphur-extractive which is found in normal urine. Pathology has not yet succeeded in throwing any useful light upon the circumstances under which the cystine diathesis occurs; the rarity of this deposit proving fortunately, an obstacle to the extension of our knowledge in that direction. Its occurrence is occasionally hereditary; and appears to be little subject to any therapeutical control.

The Uric or Xanthic Oxide Deposit.—This is the rarest of all the urinary deposits; and was first described by Dr. Marcet, as the constituent of a calculus weighing eight grains. Neither its pathological history, nor its chemical properties and relations, have been so clearly ascertained as to demand notice in a practical work. It has chiefly been discovered in children, in the form of calculus. Dr. Douglas Maclagan lately found in the urine of an hysterical female traces of what appeared to be uric oxide; and his investigations led him to regard the substance found in this case as identical with one of the normal coloring matters of the urine, precipitated upon a basis of earthy phosphates. It showed under the microscope granular laminæ, of irregular form, having the chemical characters described as those of cystine.[1]

Formation and Varieties of Calculi.

The persistent establishment of any of these deposits renders the patient more or less liable to the formation of calculi, and is therefore justly regarded as a calculous diathesis. A nucleus having formed in some part of the urinary passages, the particles of the prevailing deposit are aggregated around it, sometimes in a homogeneous manner, more generally in layers, which may not unfrequently differ widely in composition. The nucleus may come from within or from without. A foreign substance introduced into the bladder, by the urethra, by wound, or by ulceration, and remaining in that viscus, soon becomes coated by calculous matter, even though previously no tendency to such deposit existed. Barley-corns, straws, beans, portions of bougies, or bullets which have gradually worked their way inwards, may thus prove nuclei; also portions of instruments, lint, or other matters, used in operations on the bladder; or a portion of necrosed bone may find its way, by ulceration and abscess, into the viscus. By far the most common nucleus, however, is provided by the urinary organs themselves. A few particles of uric acid, or of oxalate of lime—for these, the former more especially, are found to be most prone to formation in the kidney—become coherent immediately after secretion; and by such aggregation a nucleus is at once formed, soliciting farther addition. This addition may be made at the original site of aggregation, the kidney: more frequently, however, descent takes place into the bladder; and the small renal concretion then becomes the nucleus of a vesical calculus. Or blood, escaped from the kidney or mucous coat of the bladder, may afford a mass of fibrine, which in like manner may originate the

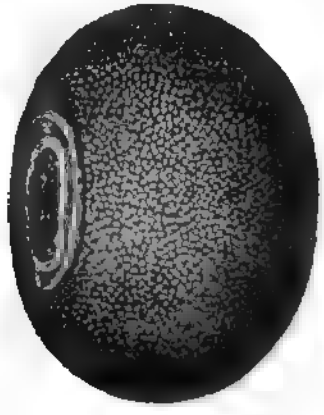
[1] Monthly Journal, Aug. 1851, p. 131.

formation; all the more readily, of course, if a gravellish tendency previously exist. As the stone enlarges, the original nucleus usually retains its central position; the stone moving loosely in the bladder, and receiving addition equally on all sides. Sometimes, however, the stone is found to occupy a steady position, even when not encysted; lying undisturbed behind an enlarged prostate, having one side in constant and immediate contact with the mucous membrane, and presenting only a part of its periphery to the source of additional deposit. In such cases, the nucleus will be found occupying a lateral position in the stone's section; enlargement having taken place almost exclusively on that aspect which looked into the free interior of the viscus.

Stones vary in their nature according to the diathesis which prevails during their formation. The following are the varieties:—

I. The *Uric Calculus;* consisting chiefly of uric acid, but often containing a greater or less proportion of urate of ammonia. This is by far the most common class; comprising probably about two-thirds of all calculi. The color is brownish red, sometimes like that of mahogany; the surface is either quite smooth, or finely tuberculated by crystals; a section shows aggregation of the particles in a concentric arrangement;

[Fig. 192.]



[Uric Calculus, showing its finely tuberculated surface. (From Gross.)—Ed.]

the form is generally oval; and the size may vary from that of a pea to that of an orange. The tests are—solubility in caustic potass; gradual consumption before the blowpipe; digestion in nitric acid, and gentle evaporation, producing a scarlet residue, which becomes purple on the addition of ammonia.

II. *Urate of Ammonia Calculus.*—This salt, as just stated, enters more or less into the construction of the uric calculi. Sometimes, but rarely, it forms a concretion by itself. The surface is similar to that of the uric; more frequently tuberculated than smooth; it is of a clay color; the fracture is fine and earthy; and the layers are concentric. This comparatively rare calculus is peculiar to children. The tests are as for the preceding; with this addition, that ammonia is evolved during solution in potass.

Fig. 193. Fig. 194. Fig. 195.

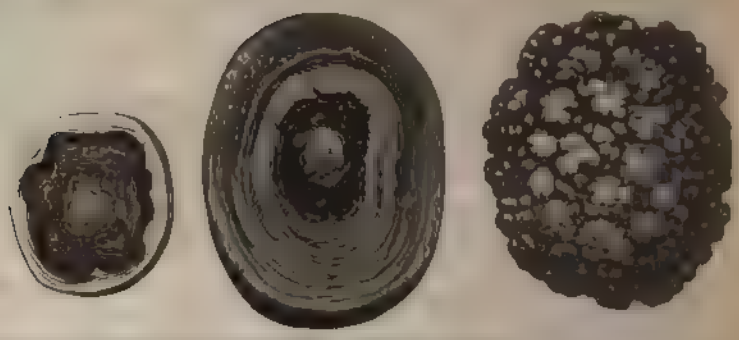


Fig. 193.—The Triple Phosphate surrounding a mulberry concretion.
Fig. 194.—Nucleus surrounded by Oxalate of Lime, and this covered by concentric layers of Urate of Ammonia. From a child.
Fig. 195.—Oxalate of Lime, or Mulberry Calculus.

III. The *Oxalate of Lime, or Mulberry Calculus;* not unlike a mulberry in size, form, and color. By no means unfrequent, especially in young people; always of slow formation. The color is dark brown; density and weight are comparatively great; the surface is almost always rudely tuberculated; the texture is imperfectly laminated; the size seldom exceeds that of a walnut; and the stone is always single. The tests are: solution in nitric acid; the blowpipe, consuming the acid, leaves quicklime in powder, which, if moistened, gives to turmeric paper a red stain.

Small calculi of oxalate of lime, in size, form, and general appearance, very like hemp-seeds, sometimes form in the kidney. Descending they may be extruded with the urine; but if one remain in the bladder, it becomes variously coated, according to the diathesis that prevails. If the oxalic diathesis continue, the hemp-seed sooner or later passes into the mulberry formation.

[Fig. 196.]

(Hemp-seed Calculus (From Gross.)—Ed.)

IV. *Phosphate of Lime Calculus.*—Calculi seldom consist of this salt alone. When they do, the surface is smooth like that of porcelain; the color is a pale brown; the texture is regularly laminated; the form is spheroidal. The stone is friable, and usually of small size. The tests are; solubility in nitric and muriatic acids, and precipitation by liquor ammoniæ; resistance to the blowpipe, unless at a very intense heat.

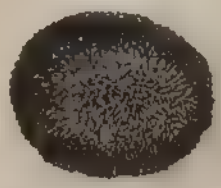
V. The *Ammoniaco-Magnesian Phosphate Calculus;* commonly called the Triple Phosphate Calculus—although that term might with fully as much accuracy be applied to the next variety. This, and the following, seldom occur as composing stones entirely; but rather as coatings or layers of others—the uric and oxalate of lime more especially. The color is nearly white; the surface is covered with minute shining crystals; the texture is not laminated, or at least is imperfectly laminated; the stone is soft, easily broken, and pulverized, and may attain to a large size. The tests are: solubility in acetic or muriatic acid; evolution of ammonia, when treated with liquor potassæ; diminution and imperfect fusion under the blowpipe, exhaling an ammoniacal odor.

VI. The *Fusible Calculus*—composed of the ammoniaco-magnesian phosphate, conjoined with phosphate of lime—is white and friable, like

Fig. 197.

Fig. 197. The Triple Phosphate, surrounding a centre of Uric Acid.

[Fig. 198.]



[Fig 198. Calculus of Ammoniaco-Magnesian Phosphate, entire, exhibiting its shining crystalline surface. (From Gross.)—Ed.]

chalk; and may stain the finger when touched; the size and form are very various. The test is, its remarkable fusibility before the blowpipe.

[Fig. 199.]

[Fig. 199. Fusible Calculus. (From Gross.)

[Fig. 200.]

Fig. 200. Section of the same, showing its internal structure. (From Gross.)—Ed.]

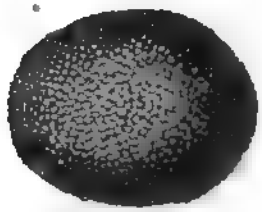
VII. The *Carbonate of Lime Calculus*, is common in the lower animals, but rare in man. It is white, spherical, smooth, and very friable; and dissolves in muriatic acid, with effervescence.

VIII. The *Cystic Oxide Calculus* is also rare;[1] of a yellowish-white color; the surface smooth, but of a crystallized appearance; not laminated in texture, but presenting the appearance of a confusedly crystallized mass; the fracture exhibits a peculiar shining lustre; small fragments are semitransparent. The blowpipe elicits a peculiar odor, like

[1] I had occasion to remove a calculus of this nature, successfully, from a patient from whom Mr. Liston had removed a like stone fifteen years before.—*Monthly Journal*, 1849, pp. 791 and 886.

that of sulphuret of carbon; and there is a ready solubility in alkalies and mineral acids.

[Fig. 201.]



[Fig. 201. Cystic Oxide Calculus. (From Gross.)

[Fig. 202.]

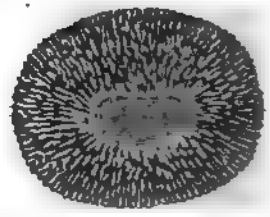


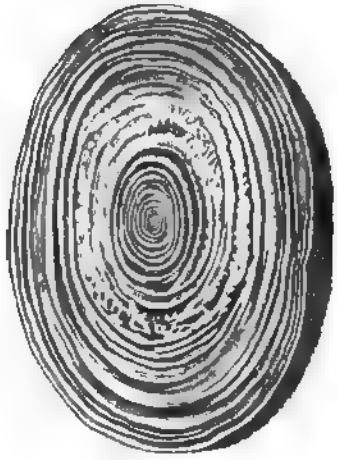
Fig. 202. Section of the same, showing its internal crystalline appearance. (From Gross.)—Ed.]

IX. *The Uric or Xanthic Oxide Calculus* is still more rare than either of the preceding. The texture is compact, hard, and laminated; the surface is smooth, the shape ovoid, the color cinnamon-brown. The tests are: consumption before the blowpipe, leaving a white ash, and exhaling a peculiar fetid odor; solubility in acids and alkalies—more readily in the latter; the residue of solution in nitric acid, evaporated to dryness, of a bright lemon-yellow color—whence the name.

X. *The Lithate of Soda* sometimes enters into the composition of calculi; but very rarely constitutes a calculus, of itself. The mass is white, friable, and soft, like what is seen in the tophous concretions of gout, in the neighborhood of joints. The tests are; solubility in caustic potash, with the aid of heat; in treatment with dilute sulphuric or muriatic acids, the soda is separated, while the uric acid remains, and may be obtained by filtration and washing.

XI. *The Fibrinous Calculus*, like the xanthic oxide, occurs with extreme rarity. And, perhaps, the term calculus is scarcely applicable to the almost solitary case on record; in which small concretions were passed, of the size of peas, yellow, like wax, and composed of fibrine—probably the result of a bloody clot, in either the kidney or bladder. Such formations, however, as already stated, may not unfrequently constitute nuclei of the ordinary calculi.

Fig. 203.



Section of an Alternating Calculus; chiefly composed of uric acid.

XII. *The Alternating Calculus*, though last in the arrangement, is not the least frequent in occurrence. Few large calculi, indeed, fail to present more or less of the alternating character; the nucleus consisting of uric acid or oxalate of lime; variously coated or alternated; the last covering invariably phosphatic, and most frequently of the nature of fusible calculus. The mul-

berry or uric calculus, having formed, creates much irritation in the urinary organs, and causes changes also in the general system for the worse; the urinary secretion becomes more and more depraved; and at last that derangement is produced which is favorable to the formation of the ammoniaco-magnesian phosphate; this is deposited on the growing stone, and, uniting with phosphate of lime, now furnished by the diseased mucous membrane of the bladder, constitutes the fusible formation.

Such are the varieties of Urinary Calculi. Those ordinarily occurring are, the uric, mulberry, phosphatic, and alternating. Forming in the kidney, and remaining there, a calculus is said to be Renal; originating in the bladder, or growing there after descent from the kidney, it is said to be Vesical; originating in the urethra, or arrested there in its passage outwards from the bladder, it is said to be Urethral; formed in the prostatic ducts, it is said to be Prostatic.

Stone is most common in temperate climates, and in early years; of adults, the old are more frequently attacked than the young. The sedentary are more liable than the active, the luxurious than the temperate, the males than the females. Certain districts are remarkably prolific in stone: Norfolk, for example; and the east coast of Scotland. The disease is doubtless hereditary, like its kindred affection, gout; and this circumstance may obviously be made somewhat subservient to the explanation of prevalence in certain localities. Frequency of occurrence leads to skilful practitioners and the flocking of patients; the patients recover, and raise a breed of men of like tendencies with themselves. Where the disease is rare, on the other hand, the treatment is less skilful; the affected migrate, and the chance of reproduction from those who remain is but slight.

Injuries of the spine obviously favor alkaline formations; causing perversion of function in the kidney, and in the lining membrane of the bladder, with want of expulsive or self-cleaning power in the latter viscus. An injury done to the kidney itself also favors stone; by disordering secretion, and at the same time furnishing coagula as nuclei for the formation. Long-continued strictures, and affection of the prostate, are obviously predisposing causes; deteriorating the secretion of urine—through disorder of the general health, and prolongation of irritation from the original seat of disease, upwards to the kidney; at the same time opposing satisfactory expulsion of the bladder's contents. Some children seem born with stone; afflicted with a congenital calculous diathesis.

The treatment of calculous disease plainly resolves itself into the following indications: 1. To prevent the formation of stone, by correction of the calculous diathesis. 2. To favor spontaneous expulsion of the stone, when formed. 3. To diminish suffering, and delay progress of the disease. 4. To remove the stone by operation, when circumstances are favorable. 5. Unfortunately, we are not yet warranted in filling up as a fifth indication, removal of the stone by lithontriptics, or other means independent of instruments.

Renal Calculi.

Renal calculi at first consist either of uric acid, or of oxalate of lime; most frequently the former. Particles cohere, either simply to each other, or round a nucleus of fibrine or other animal substance. And a beginning having been made, however slight, addition speedily takes place, provided the calculous diathesis continue—as is not unlikely, seeing that the irritation of the calculus reacts unfavorably on the kidney, causing continuance or even increase of depraved secretion. Mere sand may remain in the tubuli; but calculi lodge in the infundibula; and thence may descend to the pelvis of the kidney. And if a calculus continue in any of these cavities for some time, a peculiarity of shape is acquired—diagnostic of such formations—dependent on the form of the cavity; in fact, the stone—though at first small, oval, and smooth, like uric calculi in general—may often be said to be an accurate cast of the pelvis and infundibula. This happens when the calculus continues to be renal; more frequently, however, it descends by the ureter to the bladder; thence to be expelled by the urethra, or to enlarge into a vesical calculus. If it remain in the kidney, serious changes take place in that organ. The cavity or cavities are completely occupied; then, the size increasing, encroachment by pressure is made on the texture of the gland, until this may come to consist of little more than a mere cyst within which the large stone is contained. Sometimes active inflammatory action is kindled; the kidney suppurates; the matter, obeying the general rule of seeking the external surface, may point posteriorly; and, evacuation having taken place, the stone may be felt by the probe or finger.

The symptoms of stone in the kidney are generally as follows: A dull aching, with a sensation of weight, is felt in the loins; with a sharp pricking feeling in the region of the kidney. Sometimes there is pain in the scrobiculus cordis; sometimes there are fits of vomiting; generally the stomach is irritable. The urine, from time to time, shows an admixture of blood, more especially after exercise; and this, when rude and violent, aggravates all the symptoms. Water is made often, and with pain and heat; the testicles are painful and retracted. Numbness, pain, and cramp in the corresponding thigh are very common. Febrile aggravations are liable to occur, the kidney becoming the subject of intercurrent seizures of an inflammatory nature. Purulent matter may descend from the pelvis, and be voided with the urine; and by continuance of such discharge, by the hæmaturia, by the pain, and general disorder, serious exhaustion may ensue. Generally, irritation descends; and the bladder ultimately sympathizes more or less, by functional or organic disorder. Large calculi, occupying the whole gland, may sometimes be felt by external manipulation; and, in the open suppurated condition, a very accurate diagnosis may be arrived at, as already stated.

Generally the stone, at no long period after its first formation, descends by the ureter; this movement being induced by its own weight, and by the flow of urine. Sometimes, however, it is arrested in the

passage; an event towards which the irregular form of the calculus is manifestly favorable. The ureter may be, in consequence, either wholly or partially obstructed. Usually, the form of the calculus is such as to favor the urine's escape by its side; but still, even such partial obstruction, if long continued, may lead to very serious results; dilatation of the ureter above, of the kidney's pelvis, and of the infundibula; absorption of the proper structure of the kidney; and consequent interruption to the function of that important organ. Indeed, under such circumstances, the parts have been found reduced to the condition of a chronic abscess; the distended pelvis and infundibula being coated with a false membrane, and secreting much puriform fluid. And other dangers attend on the arrest; inflammatory action, kindled in the obstructed part, may extend to the parts adjoining, and may involve the abdomen in peritonitis; or ulceration may take place, with perforation; and through the aperture fatal urinary extravasation may occur. Complete obstruction by the arrest is fraught with the utmost peril; distension of the pelvis and infundibula, rapid and great, is likely to cause suppression of urine—always most hazardous; there is a greater risk of inflammation and ulceration than in the partial case; and the over-distended ureter may even give way by bursting. In the case of partial obstruction there is a chance—though a remote one—of ulceration proving chronic and sthenic; preceded and accompanied by plastic exudation, and consequent consolidation of tissues; advancing towards the surface; and ultimately discharging the offending body externally. Or the calculus may remain in the ureter, with partial obstruction; as it enlarges, it usually assumes the form of an hour-glass, the increase of deposit taking place chiefly at either extremity; and sooner or later death is the result. Not unfrequently, a descending stone is arrested in the termination of the ureter; one part within the ureter, partially obstructing it; the other projecting into the cavity of the bladder, and receiving increase there; constituting a troublesome variety of vesical calculus.

A small, smooth calculus may glide down the ureter imperceptibly. More frequently, descent is marked by symptoms. The patient is sick and vomits; he is alarmed, feeling a change, and afraid of the result; he is attacked by cold chills and shivering; the pain shifts from the kidney, shoots downwards in the course of the ureter, and often down the corresponding thigh—intense, and sometimes almost insupportable; the testicle is retracted and painful—the seat of neuralgia, or irritation; sometimes the irritation induces the inflammatory process, and acute orchitis results. The pulse is comparatively little affected, but fever may at any time supervene, in consequence of inflammatory seizure in the ureter, kidney, bladder, or testicle. If arrest and obstruction take place, all the symptoms are much aggravated.

The treatment of renal calculus consists in favoring descent, and palliating the urgency of the symptoms. The warm bath relaxes; opium does the same, and assuages pain; purgatives and diuretics favor descent. Smart exercise is also of service. In the first instance, antiphlogistics are not demanded; they are held in readiness for the threatening of inflammatory action. Not the least important part of the treatment is the adoption and maintenance of such means as are best

suited for overcoming the diathesis on which the existence of the stone depends. Should there be reason to apprehend arrest in the ureter, with complete or even great obstruction, diuretics and diluents will of course be refrained from. When, however, descent has been completed, and the bladder is reached, diluents can hardly be plied too actively, so as to favor complete expulsion of the foreign body.

When a large stone lodges in the kidney, and its presence can be made out with tolerable certainty, nephrotomy has been proposed; cutting into the gland from behind, and extracting the stone. This is not warrantable, however, except in those cases in which Nature has effected the greater part of the procedure; when suppuration has taken place; when the textures intervening between the stone and the surface are matted together and consolidated; when the stone has become superficial; and when, in short, there is no risk of injury being done to the abdominal cavity. Then the pointing abscess may be opened, or the aperture already existing may be enlarged, and the stone may be seized and removed. Such cases, however, are very rare, as can readily be understood.

Vesical Calculus.

As already stated, vesical calculus may originate in the bladder, formed on a nucleus there. More frequently, it may be said to be a continuation of the renal concretion. On descent having been completed, the sufferings which accompanied it generally cease; the patient enjoys a period of comfort; and he is apt to imagine himself rid of the malady. Uneasiness, however, returns; and in no long time the symptoms of stone in the bladder become marked and characteristic. The water is passed with unusual frequency, and with more or less pain. Desire to evacuate the bladder is not only frequent, but sudden and irresistible; and the evacuation does not bring relief. On the contrary, the pain, which existed during micturition, is aggravated when the bladder is empty, and when spasmodic contraction of the middle coat brings the morbidly sensitive mucous membrane into direct and rude contact with the calculus. The pain is referred chiefly to the point of the penis, with a sensation as if something lodged there; and, in consequence, the prepuce and end of the glans are liable to be pinched and pulled by the patient involuntarily. This especially takes place in children; and in them it is common to observe the forefinger and thumb pale and sodden in their points, like those of a washerwoman. We may find elongation and œdema of the prepuce, from the same cause. A slight change of posture may induce the desire for micturition. It is sure to be induced and aggravated, as well as the pain, by exercise; more especially, by being roughly jolted in a cart or other carriage; and then, too, we may expect the urine which is passed to be more or less bloody. A stooping posture is usually adopted during micturition; sometimes the patient rests on his knees and elbows; sometimes he leans over and rests on his head; the object being to avert pain, by removing the calculus from the most sensitive part of the bladder—the trigone. The water at first may flow in full stream, and then it may stop sud-

denly; the stone having moved to the posterior orifice of the urethra, and temporarily occluded it, causing aggravation of pain. By change of posture, the stone is dislodged, and the flow restored. The stone, acting constantly as a source of irritation to the lining membrane of the bladder, induces congestion there; increase and change in the secretion result; mucus coming in greater quantity, and more viscid than usual; —a wise provision, the tenacious mucus adhering to the membrane from which it was secreted, and protecting it, to some extent, from injurious contact with the calculus; what is redundant is discharged with the urine. And hence a common symptom of stone is, the presence of such mucus in the urine; settling down in the bottom of the pot, and often showing itself there in great quantity, on the water being carefully poured off. If a chronic inflammatory process have been lit up in the inner coat, the mucus degenerates still farther, and resembles purulent matter. If true inflammation have occurred, and the membrane have ulcerated, the bladder will contain more or less of true pus. And under such circumstances, the urine will generally be found dark-colored, turbid, alkaline, and fetid. The rectum sympathizes, more especially in children; the bowel becomes irritable; or hemorrhoids form; or prolapsus ani occurs. Frequently, there is sympathetic uneasiness elsewhere; the testicles may be tender and retracted, from time to time; pain often shoots down the thighs; and unpleasant heat is sometimes complained of in the soles of the feet.

The symptoms are not uniformly severe, but are liable to remissions and exacerbations; the latter, termed "fits of the stone," are attended with great agony—as the self-performed operations of the blacksmith of Amsterdam and the cooper of Königsberg abundantly testify.[1] These aggravations are induced by exercise, error in diet, or constitutional disorder; and the greater part of the suffering, it is probable, is directly dependent on spasm of the muscular coat of the bladder. The symptoms also vary according to peculiarity of constitution. One patient may suffer intensely, enjoying scarcely a moment's ease; while another complains but little, and follows his usual avocations, little disturbed; and yet the local circumstances may be very similar in both. And again, a variety in suffering is found to depend very much on the nature of the stone and the diathesis. The mulberry occasions more uneasiness than the smooth uric concretion; the rough and sharp nodules of the former coming into frequent and injurious contact with the lining membrane of the bladder. And the phosphatic stone will probably occasion more suffering than either; the general system being more deranged, as well as the mucous membrane; and both being consequently prone to resent the stone's stimulus; in other words, both the general and the local sensibility are morbidly increased. Also, with a varying diathesis, the intensity of the symptoms will vary. The uric concretion at first gives little trouble; but it becomes coated with oxalate of lime, and increase of pain may come with the formation of nodules; again the uric diathesis prevails, the rough eminences are levelled by

[1] Goaded on by torture to the desperate effort of ridding themselves from the stone by their own hands.

the new deposit, the surface once more is smooth, or at least even, and a remission in the symptoms is experienced. But then the phosphatic diathesis ensues; both kidneys and bladder are advancing untowardly in disease; a layer is forming of the ammoniaco-magnesian phosphate, or of the fusible calculus; and the symptoms are more severe than they have yet been. For not only is the aggravation of the symptoms local; the constitution also suffers, and that seriously.

By supervention of enlargement of the prostate, the symptoms may be either mitigated or increased. If the gland simply increase in bulk, the former result may take place, the swelling coming to occupy the most sensitive part of the bladder, and consequently saving that from contact with the stone. But if the gland be ulcerated towards the bladder, and the stone rest in contact with the ulcerated surface, suffering will be greatly aggravated.

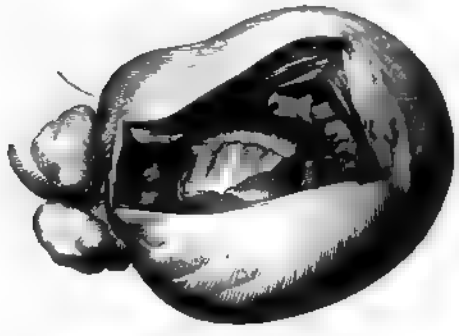
The most ordinary and diagnostic signs of stone are: frequent, sudden, irresistible, unrelieved desire to make water, pain at the point of the penis, after the bladder is empty, mucous urine, occasionally bloody, occasional stopping of the flow of urine, and restoration of the flow by change of posture. These fully warrant the surgeon in suspecting the existence of vesical calculus, and in adopting the necessary means to detect it; but of themselves, they never prove the existence of stone. The general symptoms of stone—and even these, the most pointed of them—may be very closely simulated by other affections; by organic disease of the kidney, by renal calculus, by irritation or organic disease in the rectum, by disease of the coats of the bladder, by prostatic affection, by stricture of the urethra. Certainty can never be arrived at without the use of the sound.

The continued irritation, by the stone's presence, induces serious change in the coats of the bladder. The mucous membrane, as already seen, becomes congested, and sustains perversion of its secretion; the mucus is at first viscid and clear, afterwards discolored and phosphatic. By a chronic inflammatory process the membrane may be thickened: by true inflammation it may ulcerate, discharging pus copiously. The muscular coat, under frequent stimulus to contract, and frequent obedience to that stimulus by violent and spasmodic contraction, becomes hypertrophied; after death, the fasciculi are seen coursing in their interlacements, salient and strong, with depressions between. The cavity of the viscus is contracted, and such diminution in capacity is usually proportioned to the increase of bulk in the muscular fibre. Between the fasciculi, the depressions get deeper and deeper, and frequently the mucous coat becomes protruded outwards, so as to form pouches, or sacs, of greater or less size, within which a calculus may become embayed, or a fresh concretion may form. Abscess may occur between the coats, usually discharging itself into the viscus; sometimes opening outwards, by perforation, into the cavity of the peritoneum, or into the deep areolar tissue of the pelvis—either event most hazardous—or into the rectum. And thus, in three ways, a cavity may be produced for the encystment of calculus; by internal opening of a parietal abscess, by hernial protrusion of the mucous coat, outwards, through the muscular, by deepening and enlargement of a depression between

the hypertrophied fasciculi. The inflammatory process may invade the whole coats, chronic or acute. Gangrene has sometimes occurred, ulceration and abscess are not unfrequent. In the aged, chronic cystitis is almost inevitable; then the phosphatic mucus, which attends this affection, increases the growth of the stone, and phosphatic deposit, becoming entangled in the viscid mucus which adheres to the lining membrane, may lay the foundation of other concretions, or constitute a broad adherent layer of calculous matter. The prostate sooner or later becomes enlarged, in those advanced in years. The kidneys suffer more and more by derangement of function; ultimately organic disease is not improbably produced. And under such advancement in disease and suffering, it need not surprise us that the issue of the malady is death. At the same time it is not to be forgotten, that many a patient, with large stone, bulky prostate, and diseased bladder, lives for years, and may die of an ailment with which the stone is unconnected.

The effects of time on the stone itself are important. The most obvious is enlargement; slow, in the case of the mulberry; in the uric, seldom rapid; in the phosphatic, rapid and untoward. And be it remembered, that whatever the nature of the original concretion be, its ultimate coatings will be phosphatic, if it remain long; its irritation never failing to induce the phosphatic depravity of secretion, in the kidney and in the mucous coat of the bladder. By sacculation of the bladder's walls, an opportunity is afforded for encystment. And if this take place, the symptoms are all mitigated—may, indeed, wholly disappear. But the stone slowly receives addition within the pouch; and probably will come to project through the aperture of communication.

Fig. 204.



Bladder containing a Calculus in fragments. Spontaneously disrupted. Termination fatal; by inflammatory action. (Liston. *Elements*, p. 633.)

On such projecting portion, deposit takes place with greater rapidity; and then we may expect the symptoms of stone to be revived more or less intensely. Occasionally, the stone undergoes spontaneous disruption; sometimes, after unusual violence of exercise, sometimes in connection with no assignable cause. In such cases, the stone is usually phosphatic; the particles being more loosely aggregated than in the uric or mulberry concretions. The event is generally to be regarded as

untoward, when the stone is of any considerable size.[1] Indeed, unless speedy relief be afforded by our art, the issue is almost certainly fatal. The sharp irregular fragments inflict great injury on the urinary organs; some may obstruct the urethra, causing retention of urine, with its various calamitous results; the rest excite cystitis, acute and intense; the bladder becomes filled with coagulated blood, and from this cause a formidable retention of urine may result; the kidneys sympathize; and, under a complication of disorders, the system is apt to be overborne. Lately, a case occurred under my observation, in which the immediate perils of retention by coagula in the bladder were got over, as also the first brunt of the cystitis; but at the end of the third week, the patient perished by abdominal peritonitis, found to result from extravasation of urine through perforating ulcer of the bladder.

In a few very rare cases, ulceration of the coats of the bladder has had the happy effect of permitting spontaneous extrusion of the stone; through the abdominal parietes, in the hypogastric region; into the rectum; or into the vagina. But such a result, so rare, hazardous, and improbable, manifestly cannot be taken into account in consideration of ordinary treatment.

Treatment of Stone in the Bladder.

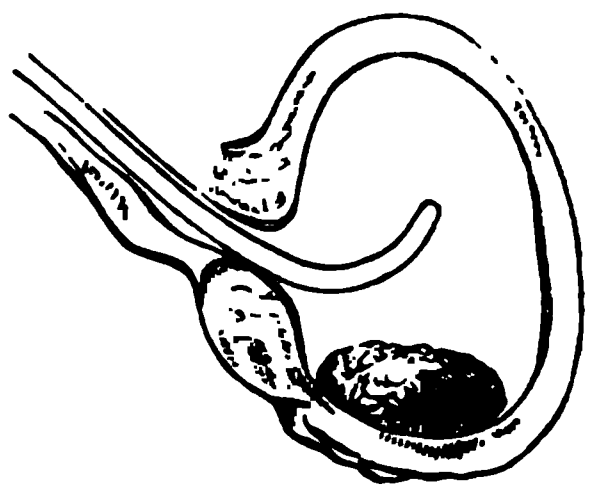
No treatment can be adopted with propriety, until an absolute assurance has been obtained of the existence of stone. And this can only be secured, as already stated, by *Sounding;* a simple operation, yet one requiring tact and care in its performance. The introduction of an instrument by the urethra, and its movement in the bladder during perquisition, must always be attended with more or less suffering—unless anæsthesia by chloroform be employed; and there must always be a greater or less risk of undue excitement following. It can readily be understood how the careless and rude use of a sound in an irritable bladder and patient—had recourse to after walking, or travelling in any way, and not protected by rest and suitable treatment afterwards—may induce a most serious cystitis, with implication of the kidney; and it is salutary to remember that a cystitis thus caused has once and again proved fatal. A patient—say from the country, and just arrived—presenting himself with the ordinary symptoms of stone, is not at once to be sounded, and at once dismissed. We should first ascertain that pulse, kidney, and bladder are sufficiently quiet to admit of this operation being practised with impunity; and, after its performance, rest should certainly be enjoined for some time, perhaps with sedatives, or even antiphlogistic treatment. It is in itself an important operation. and should be regarded as such. In children, and in irritable adults, it is well to use chloroform, as formerly stated (*Principles*, 3d Am. Ed. p. 740.)

The instrument is of steel, of medium size, straight till within two inches of the extremity—where it is sharply curved—and furnished

[1] A small stone, spontaneously disintegrated, may be expelled by the urethra, without much suffering, and with no danger.

with a broad and smooth steel handle: of steel, and broad in the handle, so that its impingement on the calculus may be the more distinctly felt; and of a sharp, short curve at its end, so that the straight portion being in the urethra, while the whole of the curve is within the bladder, the end may be moved about in that viscus freely, and in all directions; of medium size—not so large as to be grasped tightly by the urethra, and so be limited in its movements—and yet large enough to afford a steady grasp to the operator, with surface enough for readily striking the stone. The bladder should be as much distended by retained urine as the patient can conveniently bear; so as to afford room for the instrument's play. The patient is placed recumbent; and, the sound having been gently introduced, the convexity of its curve is pressed in the direction of the ordinary site of stone—at the most dependent part of the bladder, behind the prostate. There, a hard substance being felt, the instrument is moved sharply, with a gentle striking movement; and, in addition to the rub which was at first conveyed to the operator's hand, a distinct *click* will be heard, while a more defined and vivid impression of impingement on a foreign body will be felt. And without this combined indication of touch and hearing, the surgeon should never be satisfied of the existence of stone. If nothing be found in the ordinary site, the instrument's point must then be moved carefully and inquiringly in every direction; groping at first, as a probe; and, on finding resistance, moved with a sharp yet gentle stroke. Of four sources of fallacy we must be constantly on our guard; the rub of the end of the sound on fasciculi of the bladder;[1] the grating of it on calculous matter entangled in the mucous lining; the rub of a rough and enlarged prostate; and the rub and grating of calculous matter in the prostatic or membranous portions of the urethra. If nothing is found in the ordinary site and in the ordinary way, posture is changed, and the search renewed; first in the erect posture, and then with the patient stooping much forward. The space above the pubes, in the latter position, is particularly explored. The stethoscope may possibly be of service, applied over the region of the bladder; but it is difficult to repress the thought that, wherever a stone actually is, the signs emitted by the sound's use will be sufficiently distinct, without the aid of mediate auscultation. Change of posture having failed to detect stone, change in the state of the bladder may next be tried. The urine may be allowed to dribble away by the side of the sound; and, as the bladder contracts, the sound is moved gently in various directions, so as to favor

Fig. 205.



Sounding. The stone in its ordinary position.

[1] In using the catheter for retention of urine in the aged, a fasciculated portion of the thickened bladder sometimes comes suddenly in contact with the end of the instrument, interrupting the urine's flow, and giving the sensation of stroke or rub to the operator's hand. This, to the unwary, may simulate the presence of stone; and has to be guarded against accordingly.—Vide *Adams on Diseases of the Prostate*, pp. 76, 77.

distinctness in the sensation of contact, should the stone descend upon it. Or a catheter, shaped like the sound, may be substituted; and, during rapid contraction of the bladder, contact may be ascertained. After failure by all the ordinary means, success has followed the use of an elastic catheter in this way: With the bladder full, the patient, erect, makes water in a full stream through the instrument; and, as the last drops escape, the stone falls on the point of the catheter and is felt.

Whenever difficulty is experienced in detecting a stone, in a case with plain symptoms, it is better to repeat gentle exploration at intervals, than by one continuous and prolonged perquisition to endanger the occurrence of cystitis and sympathy of the kidney—perhaps peritonitis by extension, and death. In children, the prudent surgeon is not satisfied with any obscurity; the click and rub must both be very distinct; the restlessness and crying of the patient being otherwise apt to lead to deception. It is chiefly in such cases that blank lithotomy has been performed. And to guard against this, it is in such cases that the use of chloroform is especially serviceable (*Principles*, 3d Am. Ed. p. 740).

But by the sound's use, we may ascertain some of the characters of the stone, as well as its existence. Moving the point over the stone's surface, we may be able to estimate the smoothness or roughness of it. Passing it over, and on all sides of the stone, we may obtain some idea of its form and bulk; and by the finger of the other hand in the rectum, we may sometimes be greatly assisted in this conclusion, by feeling its weight, as it were, while at the same time its diameter, at least in one direction, is made apparent.[1] Moving the sound in the bladder, we may have a distinct sensation of one stone being left, while another is encountered by the instrument; or plurality of stones may be indicated by another circumstance, the stroke of the instrument eliciting different sounds at different parts of the bladder—the sounds differing as to clearness and as to pitch or tone. Also, a large stone is at once detected; a small one may long elude the sound. And again, while the rub and grating imparted by a large stone are most distinct, the click of a small stone is more clear and defined; and the following practical inference may be almost arrived at—the smaller the stone the sharper and more distinct the click; the larger the stone the more palpable the feel. Farther, when the symptoms have been of long duration, we may expect a large stone; and *vice versa*. Also, phosphatic formations are apt to be larger than those of any other kind.

Having, by sounding, ascertained the existence of Vesical Calculus, the treatment of it naturally resolves itself into the following indications:—

I. *Assist Nature's effort to expel the offending body.*—This, obviously, is applicable only to calculi of small size; those, for example, which have recently descended from the kidney. Their natural progress is outward, with the current of urine. And in females this is usually effected readily; the urethra being short, straight, capacious, with its

[1] It is right to remember, however, that, in the adult, stone may not be felt by the finger in the bowel.

current impetuous; and hence one reason why vesical calculus in the female is rare. In males, however, there are many obstacles. The urethra is both long and tortuous, it is comparatively narrow besides, and its current is proportionally defective in expulsive force; spasm, too, is liable to interfere. And yet, judiciously assisting nature, small stones may be thus got rid of, by dilatation of the urethra, diluents, and forcible voidance of the urine. By the occasional introduction of bougies, the urethra is brought to more than the normal dimensions, while its irritability is also diminished;[1] and, by the use of diluents, the flow of bland urine is considerably increased. It is well, also, to accustom the bladder to considerable distension by its contents. Then, with the bladder full, and the urethra occupied by a full-sized bougie, the patient stands stooping; and, the bougie having been suddenly withdrawn, evacuation is made in as full and forcible a stream as possible. In the case of enlarged prostate, the main obstacle to the escape of a small stone by the urethra is at the lower or posterior part of the outlet; it is well, therefore, under such circumstances, that the patient expel his urine in a recumbent and prostrate posture.

The only objection to this mode of treatment is the risk of arrest in the urethra, inducing retention of urine with its many dangers.

II. *Attempt disintegration, medicinally.*—Attempts at expulsion having failed, or being deemed inadvisable, the following other modes of removal may be thought of; solution within the bladder, forcible abduction by the urethra, disintegration by mechanical means, excision. The first of these indications may be attempted in two ways; by medicines given by the mouth, and by injections into the bladder. Of the former class of remedies, the alkalies are the most prominent; especially the carbonates of soda and potass, given in small doses very copiously diluted, imitations of the natural waters of Vichy, of repute in calculous disorders. The oxalate of lime calculus resists their influence. But the uric formations may be benefited in two ways; alkalies thus given tend to correct the diathesis whereby the calculus has arisen, and at the same time have undoubtedly a sedative and corrective effect on the urinary organs, improving the secretion of the kidneys, and assuaging the irritability and disorder of the mucous coat of the bladder. They arrest growth, and palliate the symptoms of stone; and experience would seem to say that a slow and uncertain diminution of the stone occurs during their sustained use. Farther, the voice of experience certainly conveys the fact that their continued use, provided it be in small doses, greatly diluted, has no injurious consequences either on the renal secretion or on the general health.

In the case of phosphatic formations, large doses of alkalies must prove prejudicial; but doses, such as already mentioned, fail to do harm, and at the same time seem to have the effect of favoring gradual disintegration of the stone, by solution of the animal matter, whereby the calculous particles cohere.

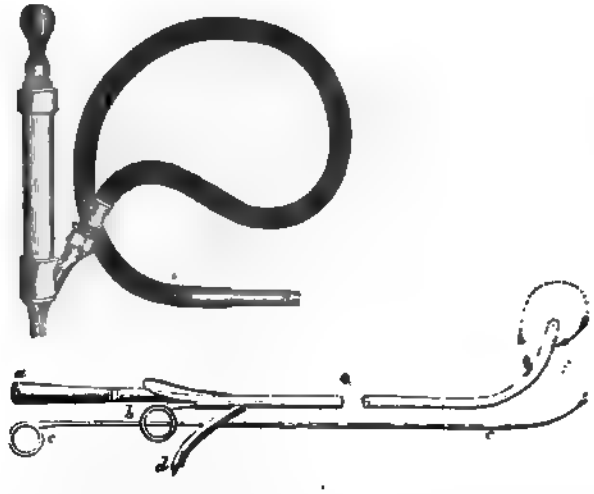
Farther experience in the use of these simple lithontriptics is much

[1] It has been proposed to introduce belladonna into the rectum, so that the neck of the bladder may be relaxed and dilated, like the iris.

to be desired. But it is to be feared that the long-continued use which is essential, and the uncertainty of the issue, will prevent any general employment of, or confidence in them. No doubt, however, they are of much value, in a subsidiary place, as means of delaying the increase of uric formations; favoring disintegration of phosphatic calculi, as a prelude to Lithotripsy, for example; in all cases of stone, improving the state of the urine and of the lining membrane of the bladder, and so mitigating the distressing train of symptoms.[1]

Solvent injections into the bladder have been in use since 1792, with various degrees of expectation. As yet, unfortunately, their success is far from great; and we dare only place them in the same subsidiary rank as internal lithontriptics. The agents employed have naturally been alkalies and acids; the one in uric formations, the other in phosphatic; introduced by means of a syringe operating on a double canula, whereby a constant stream may be kept in play on the calculus within

[Fig. 206.]



[Double Canula, with a Read's Syringe, for injecting the bladder. The middle figure represents the canula, or catheter, divided into two tubes, as marked by the dotted line, and also the star. The nozzle of the syringe is received at *a*; the fluid is forced along the tube, escapes *into* the bladder by the aperture marked by an arrow, *from* the bladder it is withdrawn by the syringe through the aperture marked by the other arrow, and escapes from the tube at *d*. If the orifices become clogged at any time, they can be reopened by means of the flexible and elastic stylet, *ee*, which is so large as nearly to fill the tube, and which may be introduced either at *a* or *b*, the latter orifice being represented in the drawing as closed by a plug. (From Ferguson.)—Ed.]

the bladder. The objections are the same as before; delay in treatment, and uncertainty in effect. The acid injections, however, may be not without their efficacy, as palliatives of the symptoms attendant on phosphatic calculus; employed weak, as correctives; not strong, as solvents. Of late, the carbonate of lithia has been supposed a promising

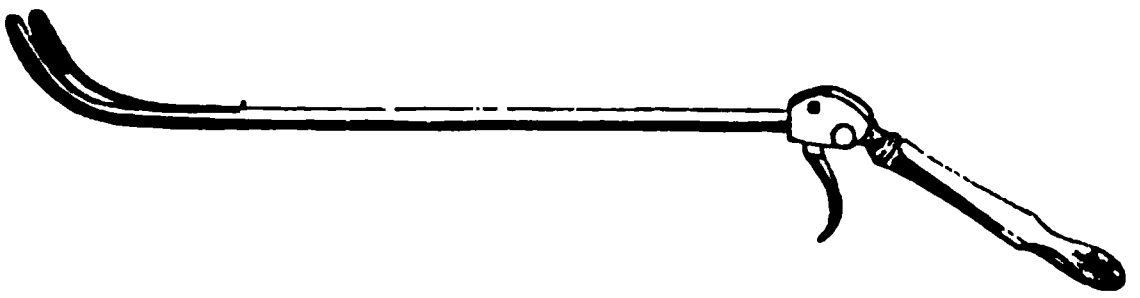
[1] At all times, however, even the most cautiously sustained use of alkalies must be watched, lest serious injury accrue to the system, by its over-saturation with them.—*Vide Lancet*, No. 1177, p. 318.

solvent for uric concretions; and the salts of lead have been proposed as suitable for injection in the case of the phosphatic.

III. A method of *snaring* has sometimes proved successful in the case of small calculi. It having been observed that, in removing catheters used on account of retention, small calculi were occasionally found entangled in their eyelets, or lodged in the tube, it was thought that in cases of calculus, this, when small, might so be ensnared and withdrawn. M. Bourguenod was the first to adopt the practice, and he met with a few imitators. But success depends evidently too much on chance, and that chance is too remote to admit of the procedure being favorably entertained by the practical surgeon.

IV. *Forcible evulsion* may be attempted by the urethra. By the forceps of Cooper, a small stone may be seized and withdrawn. But

[Fig. 207.]



[Sir A. Cooper's Instrument, improved by Mr. Weiss. At the point it consists of two blades hollowed within, which can be made to open by means of a stylet, connected with a trigger near the handle. When in the bladder, the blades are made to open by pressing upon the trigger, and they close again by their own elasticity. Thus, by opening and closing the blades, and moving the instrument, small concretions may be caught. (From Fergusson.)—Ed.]

all such proceedings have been justly superseded by Lithotripsy. The perquisition was painful and tedious; in seizing the stone, the lining membrane of the bladder was liable to receive injury; and, after seizure, it was not improbable that the attempt at extraction might prove abortive; the stone perhaps becoming impacted in the urethra, and locked at the same time most inconveniently in the jaws of the instrument.

V. *The Calculus may be disintegrated by Instruments.*—In fulfilment of this indication there are two methods; Lithotrity, and Lithotripsy; the latter the more modern and preferable.

Lithotrity signifies a boring or rubbing of the calculus, in the hope of its becoming pulverized. This was first put in practice—at all events in modern times[1]—in 1800, by General Martin; who operated on himself, with partial success, by means of a file. In 1813, Gruithuisen proposed the use of a canula, through which, by means of a wire, the calculus was to be noosed, and then attacked by a borer. In 1819, Elderton invented a more feasible instrument. But neither of these were used in practice. In the same year, Dr. Arnott did good service, in illustrating the capabilities of the urethra and bladder, for the reception and play of suitable apparatus. In 1822, Amussat and Le Roy busied themselves in this department; the latter most ingeniously. And in 1823, M. Civiale, availing himself of the labors of his predecessors, invented a three-branched boring apparatus; well adapted for drilling stones when caught—equally apt, however, to seize the coats of the

[1] Albucasis and Sanctorius had notions of bruising stones, and invented instruments for the purpose.

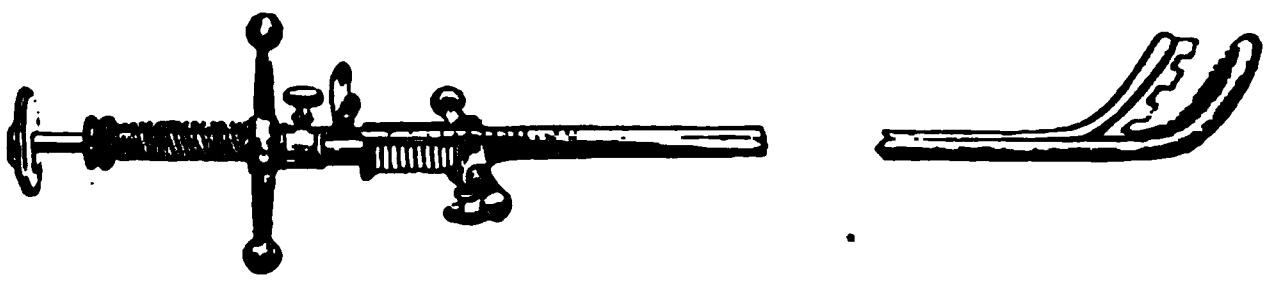
bladder, and not very well adapted for disposing of the stone effectually. Its success in practice proved but indifferent. And now, all such implements have been superseded by the crushing apparatus—more simple, safe, and effectual—whose use constitutes Lithotripsy.

Lithotripsy.

To remove calculus by crushing is a more modern idea than that of boring or drilling. Various instruments have been proposed and used; some with screws, some with hammers. At present, the voice of the profession apparently prefers the former; on the principle of the instrument originally invented by Mr. Weiss in 1824; composed of two blades, abruptly curved at the extremity—the one sliding on the other, and propelled by means of a screw.

[The proper selection of instruments being of considerable importance in the performance of Lithotripsy, we shall take the liberty of introducing here, several drawings from Mr. Fergusson's last edition, exhibiting the most approved forms.

[Fig. 208.]



[Large screw Lithontriptor of Mr. Weiss.]

Fig. 208 exhibits a screw instrument of Mr. Weiss, large and strong, for crushing large and dense concretions; the male blade being serrated, and the female fenestrated, for the purpose of breaking the stone, and forcing the fragments from the jaws of the instrument into the bladder

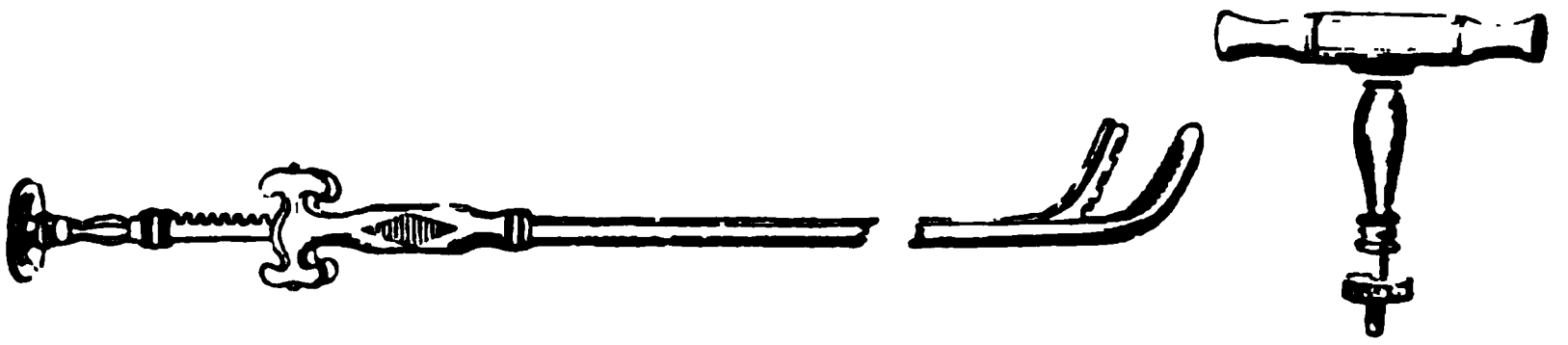
[Fig. 209.]

[Plan of the Extremity of the Blades.]

again, so that when the former is withdrawn, the lining membrane of the latter and of the urethra shall not be injured.

Fig. 210 represents an instrument of Mr. Fergusson, in which the

[Fig. 210.]

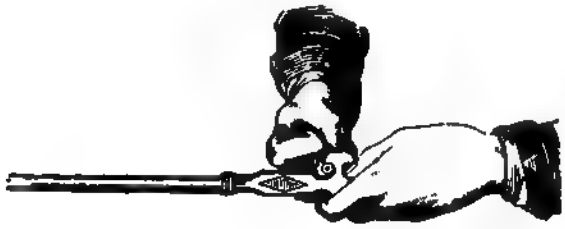


[Mr. Fergusson's Instrument, the male blade being moved by the key.]

ordinary screw is modified, so that a key is used to move the male blade.

This lithontriptor is introduced into the bladder in the ordinary manner; the stone is caught, and, after the surgeon has assured himself

[Fig 211.]



[The Instrument as held while in the act of crushing the stone.—Ed.]

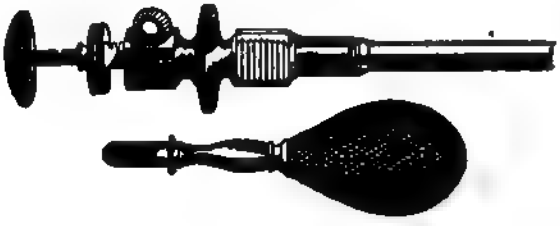
that the mucous membrane is not included in the grasp of the instrument, the key is applied and used as shown in Fig. 211, or as in Fig.

[Fig. 212.]

[The Instrument as held while in the act of crushing the stone.—Ed.]

212. Mr. Fergusson prefers to stand on the patient's left, and holds the instrument as in the last figure.

[Fig. 213.]



[The French Instrument noticed below. (From Fergusson.)—Ed.]

Mr. Fergusson mentions a recent Parisian improvement upon this instrument, which was exposed at the Great Exhibition. (Fig. 213.)

"The rack consisted in a series of circles, and the part for the reception of the pinion or handle could be made to revolve in such a way, that the handle could be applied with perfect ease, in whatever position the instrument might lie." (*Fergusson's Pract. Surg.* Philad. 1853.) Mr. Fergusson prefers his own instrument, however, as being more simple, and because the movement of the blades is better.—ED.]

A stone having resisted all endeavors towards its spontaneous expulsion by the urethra—and after, perhaps, a vain attempt has been made towards disintegration by medical means—has but two ways of being efficiently dealt with—Lithotripsy, and Excision. Some years ago, a hot controversy was waged between the supporters of these operations; each party maintaining its adopted procedure to be the best, and applicable to all cases of stone in the bladder; one party attempting to grind or crush every stone that presented itself, the other using the knife indiscriminately. Fortunately, a better state of things now exists. The well-educated surgeon, finding himself equally well qualified to perform either operation, is in a position to consider, calmly and impartially, the bearings of each case that comes under his care. Some he finds suitable for Lithotripsy, others not; and so some stones he attempts to crush, and others he at once sets aside for excision. And therein he does well. The one operation does not, and cannot, wholly supersede the other; and yet there is every reason to believe that often the crushing operation is by much to be preferred; not less formidable in all cases of stone; but certainly less formidable in those whose circumstances we recognize as adapted to its use. The indiscriminate employment of the operation, however, has been fully established as somewhat more fatal than the indiscriminate performance of Lithotomy.

The cases favorable to Lithotripsy are of the following character: The urethra must be free from stricture; the prostate must not be large; the bladder must be not much diminished in capacity, comparatively free from irritability, and not sacculated; the kidneys must be organically sound. Otherwise, the instruments will not have room for safe and efficient play; the risk of cystitis will be great; aggravation of renal disease will be certain; and fragments, being received into sacculi, will be placed temporarily beyond the reach of treatment, and will enlarge into fresh calculi. The stone itself must be of no great size, and of no great toughness. The mulberry calculus is usually dense and firm enough to resist all the pressure which may be exerted safely; stones of large size —say of uric formation—are obviously not amenable to the grasp of the instrument; and, even if they were, the number of rough fragments, and the many seizures which would be required for their pulverization, would obviously tend to serious mischief in the bladder. Farther, it were well that no great amount of viscid mucus were secreted from the bladder; for this, entangling part of the *debris*, is likely to retain more than one nucleus for the reproduction of stone. Such are the cases favorable for Lithotripsy; when the urethra and kidneys are organically sound, and the bladder and prostate are but little altered; the stone small and soft; the system not irritable. At one time it was supposed that the operation should be limited to adults; the parts of the child being too limited for free and safe use of the instruments. Experience

has proved, however, that such objection does not hold good; and that with suitable instruments, carefully and skilfully used, Lithotripsy is quite as applicable to the adolescent as to the adult.

Even in the favorable cases, Lithotripsy is not without its risks and disadvantages. In the hands of the most expert, the stone is not always readily and at once caught, and perquisition may consequently be tedious and hurtful. The fragments must irritate the bladder more or less, entailing at least some of the hazard which attends on spontaneous disruption (p. 457). Fragments passing by the urethra create much irritation there, and may induce serious inflammatory action, extending to the bladder; or a fragment may be arrested in its outward passage, and cause perilous retention of urine. Small portions may remain behind, eluding the sound, and becoming sure nuclei for reproduction, loose in the bladder, entangled in adherent mucus, embraced by a fold of membrane, or embayed in a sacculated cavity. One operation is seldom sufficient; repetition is necessary, perhaps once and again; and, under this, serious constitutional disorder may arise, prominently connected with renal disease. It has been well remarked by Dr. Willis, that even the successful cases may present the following degenerate class of symptoms. Although the stone is gone, "the man is not quite well; irritability of bladder to a greater or less degree remains behind; this irritability increases; the constant services of the medical attendant again become necessary. The patient is next tormented with ceaseless pain in the region of the bladder, which by and by extends up the loins, and settles in the back. The urine has never been healthy in its character, or it has altered at an early period of these untoward symptoms; by and by it becomes like turbid whey; it has a faint, sickly smell, it coagulates on the addition of nitric acid and when exposed to heat; the patient loses flesh and strength, his stomach fails him, he becomes sick and vomits, he begins to dose, and then he falls into a state of coma from which he never awakes, or he is seized with convulsions in which he expires.[1]

Such, then, we hold to be the true position of lithotripsy, applicable to certain cases of stone; for these, less hazardous than lithotomy, and therefore to be preferred; always, however, liable to the objections of long time, comparatively, consumed in treatment, risk by repetition of the operation, and the danger of exciting or aggravating renal disease.

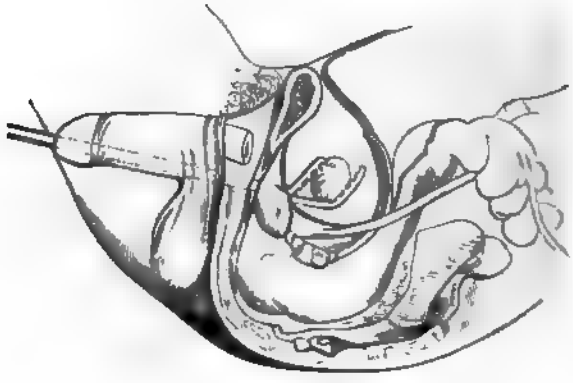
When a favorable case presents itself, the operation is not at once performed; a certain period of preparation is essential. The general functions must be placed in a healthy state, tongue clean, pulse natural, bowels open, skin acting well, &c.; all phlogistic tendency must be overcome, by a certain amount of antiphlogistic regimen; the urethra, if need be, must be dilated, and deprived of morbid irritability, by the occasional use of a bougie; the bladder, too, must be accustomed to tolerable distension. A weak solution of the bicarbonate of potass or soda may also be given, with the double view of amending the secretion of urine, and assuaging both renal and vesical irritability, especially the

[1] Willis on Stone, p. 108.

latter, at the same time favoring disintegration, by loosening cohesion of the calculous particles (p. 462).

Circumstances being deemed favorable, the patient is placed recumbent, on a convenient table, bed, or couch, with the pelvis elevated on a cushion, so as to throw the stone into the fundus of the bladder, away from the neck, and with the bladder as full of urine as possible, in order to admit of seizure, retention, and crushing of the stone taking place within the cavity, at a safe distance from the coats. And if there be any doubt as to the quantity of urine retained for this purpose, let a sufficiency of tepid water be slowly injected by means of a syringe and catheter. Then the lithontriptor, having been introduced, with its curved portion of the fixed blade hollow, so as to prevent inconvenient impaction of fragments, is used first as a sound, and the stone is

Fig. 214.



Plan of Lithotripsy. The stone caught, and the instrument in a suitable position for crushing.

usually struck where it is to be expected, at the then most dependent part of the viscus. On the mucous coat of the bladder at this point, the convexity of the instrument is made to press, while at the same time the thumb of the right hand moves the sliding blade backwards; then a slight wriggling movement is made with the wrist, and the stone, tumbling into the depression made by the downward pressure of the instrument, is felt between its jaws and secured. The direction of the lithontriptor, now holding the stone firmly, is then changed, so as to bring the stone into the supposed centre of the viscus, away from the mucous coats, and with urine all around. Then the screw is applied, and the work of crushing proceeded with. But if there be any doubt as to the instrument being free of the lining membrane, it must, in the first instance, be moved from side to side, or turned round, so as to make sure of this essential point. A small friable stone may be pulverized at one seizure. Usually, fragments are made, which in their turn require separate seizure and crushing. And for this latter work, a form of lithontriptor is preferable, whose fixed blade is not hollow at the curve; there is now less chance of clogging such an instrument, and, when imperforate, it is more efficient in dealing with small fragments, which might in a great measure elude the force of the weapon

first used. Enough having been done—and to estimate this, we must consider not only the amount of crushing, but also the patient's tolerance of the proceedings—a full-sized catheter is introduced, shaped like the lithontriptor; on opening its jaws, urine with the finer of the detritus freely escapes; and this extrusion—harmless and painless, because passing through the metallic instrument—may be favored by once and again injecting the bladder with tepid water, by means of a syringe fitted to the catheter, but only provided the feelings of the patient admit of this. The patient is put to bed, absolute rest is enjoined, opiates are freely administered, by both mouth and rectum, if need be; diluents are given, and antiphlogistic regimen is enjoined. Should excitement threaten, local loss of blood and hip-baths may be required. During some days, fragments and sand continue to pass, with more or less suffering, and, by and by, again the urine becomes clear and free. The bladder and system recover from their disorder, a tolerance of the operation is again established, and repetition may consequently be proceeded with, with all due caution. When, after one or more sittings, we have reason to suppose that the stone has been completely crushed and passed, careful perquisition is to be made with the ordinary sound, used carefully, while urine is escaping from the recumbent patient, and repeating this search after injection of the bladder with tepid water. Should such careful searching fail to detect any lurking fragment, the patient may be relieved from treatment, much care being expedient for some considerable time, however, lest either renal or vesical disorder, especially the former, ensue.

It has been a question whether chloroform should be used or not in this operation; the objection being that the patient's feelings are useful to determine whether or not injury to the bladder's coats is avoided, and that in deep stupor the urine is apt to dribble away involuntarily, perhaps emptying the bladder ere the operation is well begun. The former evil may be escaped by care and skill in handling the instruments, the latter by pressure of the fingers, or the use of a jugum penis. The advantages of anæsthesia are evident; especially in relaxing all spasm, as well as voluntary effort, which might impede manipulation.

Lithotomy.

This operation is very suitable to children. It is preferable to lithotripsy in adults when the stone is large, and when it consists of the oxalate of lime; also when the bladder is intolerant of perquisition and distension. There are various modes of performance; the lateral and bilateral; the high operation, or supra-pubal; the recto-vesical. For ordinary cases, the lateral is much to be preferred.

As early as the year 318 B. C., the ancients cut out stones, by incising the perineum freely, the stone having been made prominent there by fingers introduced within the rectum; and this operation—"cutting on the gripe"—continued in use till the sixteenth century. In 1525, Johannes de Romanis, of Cremona, incised the bulb on a sound, prolonging the wound into the membranous portion of the urethra; the neck of the bladder he then dilated by male and female conductors,

until the wound was deemed sufficiently wide for the introduction of forceps and removal of the stone. This operation—termed, from its complexity, the method by the "apparatus major," or the Marian method, from the name of an especially eloquent advocate of its superiority to all others—continued in vogue until 1697; productive, however, of only indifferent success. In that year, Frère Jacques appeared; the advocate of incision, as preferable to laceration; at first cutting recklessly and ignorantly into the perinæum, by an instrument very like a dagger; afterwards operating with a common scalpel, and incising the prostate and neck of the bladder with scientific precision—having specially studied anatomy under Duverney, at Versailles. This was the foundation of the lateral method; afterwards practised with much success by Raw in Holland, and subsequently by Cheselden in this country—but not successfully by the latter surgeon, until he had recovered from mistakes into which he had been led, by the disreputably mysterious use which Raw had made of the knowledge which he obtained from the honest Friar.

We shall describe the lateral operation as ordinarily performed by modern surgeons; and more especially as we were taught it by the late Mr. Liston. From his high authority, in one point only would we venture to dissent. He was opposed to much preparation of the patient, conceiving that delayed expectation of the event operates injuriously on the mind, and disposes to sinking, or at least to asthenic results. On the contrary, we think preparation quite as essential here as in the case of lithotripsy. We hold that it is necessary to subdue phlogistic tendency, to rectify general function, to quiet the bladder and system, and to amend the state of the urine—before the operation can be performed under auspicious circumstances; and that such preparation ought invariably to be completed, whether the time occupied be of weeks or days. Among other items of management, the carbonates of soda or potash, in weak solution, not only may be expected to produce the good effects on the bladder formerly mentioned (p. 461); but besides, the urine, by their use become less acrid than usual, will prove less hazardous in the event of infiltration in the wound.[1]

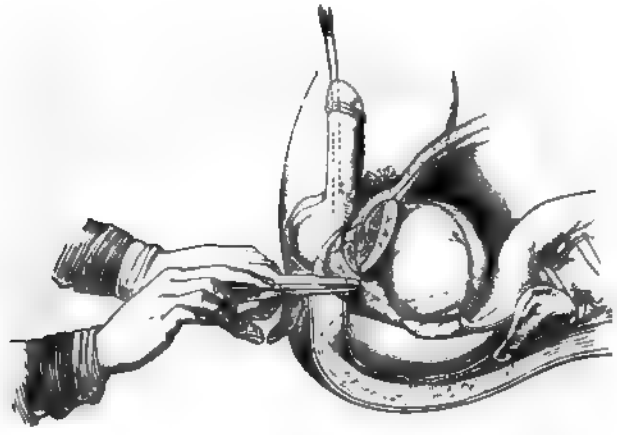
The patient is placed on a firm table, of convenient height; and is bound securely, hand to foot, by stout tapes. In no operation is anæsthesia by chloroform more suitable or safe (*Principles*, 3d Am. Ed. p. 741). It is well to clear the lower bowel, the evening before, by an enema, or by castor-oil; and the bladder should be moderately full of urine. A staff is passed, of as large a size as the urethra will conveniently bear; grooved deeply on the convexity, a little to the left side.[2] It will be more readily introduced before than after deligation; and the surgeon should be satisfied, before he proceeds a step farther, that it impinges on a stone. If in doubt on this point, let him withdraw the staff, and introduce a sound. It is essential that the stone be felt immediately before the operation. Deligation over, and the staff satis-

[1] An American surgeon, of great repute as a lithotomist, attributes his success not to any peculiarity in the mode of operating, but solely to his long-continued and careful preparation of the patient.

[2] The late Mr. Key used a straight staff. (*Treatise on Section of the Prostate in Lithotomy.* London, 1824.) Dr. A. Buchanan uses and recommends a rectangular staff. (*Monthly Journal*, Feb. 1848, p. 554.)

factorily passed, the patient's nates are brought to project a short distance over the end of the table; and there he is to be secured by assistants; one placed behind, with a hand on each shoulder, ready to oppose any involuntary movement away from the operator; and one to each limb, holding them apart, and pressing each femur firmly down into the acetabulum, so as to fix the pelvis and at the same time fully expose the perineum. To the principal assistant, the staff is intrusted; to be held very steady, in a vertical position, and hooked up against the pubes—as much space as possible being thus made between the membranous portion of the urethra and the rectum; and the same assistant keeps the scrotum elevated. The surgeon, seated in front, at such a height as to bring his hand conveniently on a level with the perineum—and with all the instruments he is likely to require spread on a towel or tray on the floor by his side, so as to be within easy reach when wanted—introduces his left forefinger into the rectum, to make sure of its being empty, and to stimulate it to contraction. The knife —longer than the common scalpel, especially in the handle, and with the posterior two-thirds of the edge blunt—is then entered in the perineum—previously well shaved—about an inch in front of the anus, on the left side; and is carried downwards beyond the anus, passing about midway between that orifice and the tuberosity of the ischium, through the skin, fat, and superficial fascia. The forefinger of the left hand is then placed in the wound, and directed upwards and onwards; with the double object of keeping the bowel out of harm's way, and

Fig. 215.



Plan of the Lateral Operation of Lithotomy. The knife entering the urethra.

dilating the space—pushing aside areolar tissue, but not tearing muscular fibre. With the knife's edge, the fibres of the transverse muscle of the perineum—if it exist—are divided, along with such fibres of the levator of the anus as resist the free onward passage of the finger. The groove of the staff is now sought for; and the finger is moved freely, so as to dilate the outward wound sufficiently—a touch of the knife's point

being applied, warily, to any resisting part. Behind the triangular ligament, and in front of the prostate, the finger-nail is lodged in the groove; and over it the knife's point is made to perforate. The knife, felt distinctly on the staff, is then pushed onwards in the groove, obliquely downwards and backwards; so as to divide the portion of the urethra which intervenes between the point of the knife's entrance and the prostate gland, and also the anterior part of the prostatic portion of the urethra. In other words, space enough is made for introduction of the finger, which follows the knife; and the base of the prostate gland is left intact. The finger, introduced and moved freely, increases the space considerably; the substance of the prostate being very capable of dilatation. And this dilatation of the wound is preferable to free incision; there being much risk in cutting through the reflection of the ileo-vesical fascia, which is situate at the base of the prostate, and which serves as an important boundary between the deep and superficial areolar tissue. By leaving this entire, the principal danger by urinary infiltration is shunned. And by dilatation of such a limited wound as now described, ample space is afforded for the introduction and play of forceps, and for the extraction of ordinary calculi.[1] Large stones require particular expedients, to be afterwards explained. In fact, the rule in this lateral operation is, to have a free external wound, and a small internal one; the latter, when dilated, extending from the point of puncture in the membranous portion of the urethra, to near the base of the prostate; the former varying in extent according to circumstances; always large and free, and largest when either a deep perineum or a bulky stone is expected to be encountered; for, the yielding of the surface both gives room and diminishes depth, in the work of extraction, as well as in the formation of the deep wound. In withdrawing the knife, some little care is necessary, lest the edge should inadvertently come too near the ramus of the ischium, and endanger the pudic artery.

The making of the deep wound requires deliberation and care; and it is expedient that the points of the finger and of the knife should move together, in order to secure exactness. In athletic adults, naturally of a deep perineum, and who are not in a state of anæsthesia, difficulty may be experienced at this stage by straining of the muscles, whereby the bladder is elevated in the pelvis, and the parts consequently removed from the control of the finger. Under such circumstances, it were rash to proceed with the knife alone. The operator must withdraw the knife; and, keeping his finger in the deep wound, he should wait patiently until the straining or spasm has ceased; establishing the full influence of the chloroform; or reasoning with the patient on the propriety of his being as passive as possible—if he be not anæsthetized; and resuming the operation, when the parts to be incised are again found to be within his finger's reach.

While the forefinger dilates the deep wound, the urine escapes more

[1] Too sparing a wound of the prostate is also to be avoided; otherwise sufficient space can be obtained only by tearing. A dense unyielding structure, demonstrated by Liston and others, at the posterior part of the gland must be divided, in order to admit of easy dilatation.—Vide *Liston's Pract. Surgery*, last edition, p. 510.

or less rapidly; and we expect that the stone, descending in consequence, will be distinctly felt. Then the staff is gently withdrawn; by means of the finger moving in contact, a more precise idea of the nature of the stone or stones is obtained—as to size, number, shape, and position; and to the circumstances thus ascertained, the subsequent proceedings are adapted. If, for example, the stone be found of larger size than what the surgeon knows will pass readily through the aperture he has already made, an addition of space may be gained, without tearing, and without the division of any parts which it is expedient to retain entire—by passing a straight probe-pointed bistoury over the forefinger retained in the wound, dividing the prostatic region of the urethra on the right side, to the same extent as on the left, and then renewing dilatation. When the stone is expected to be of considerable size, the surgeon should be prepared to adopt this bilateral incision from the first.

The wound being deemed sufficient, and the finger being in contact with a stone of ordinary character, forceps are introduced, for seizure and extraction. These should be, in length of handle and capacity of blades, proportioned to the size of the stone; the object being, that the blades shall embrace the calculus at as many points as possible, and that the handles shall be long enough to give full power in extraction. The blades are partly lined with calico, so as to diminish the chance of the stone slipping from their grasp. An instrument, suited to the stone, having been selected, is passed over the finger to the deep wound; and, as the finger recedes from this, the forceps enter and come in contact with the stone. If this is not at once felt, the handles should be elevated, so as to depress the blades to the part of the bladder where the stone is most likely to be. The blades are opened, and, by a catching movement of the instrument, seizure is effected. If any suspicion exist that a portion of the bladder may have been included along with the stone, the instrument is turned round so as to test this; freedom of movement implying freedom of the bladder. Seizure having been accomplished, the axis of the forceps is changed; the point is raised, and the handles are depressed. The forefinger is then reintroduced by the side of the instrument, and between the blades, to ascertain in what direction the stone is placed, and rectify the position if necessary. For example, if an oval uric calculus have been seized in the transverse direction, it will not pass through the deep wound without much violence, if at all. The jaws of the instrument are slightly relaxed; and with the forefinger's point the stone is gradually and carefully shifted, until the long diameter presents to the wound. Then the extracting force is applied; pressing the handles to each other as much as is necessary to prevent slipping of the stone, and not so much as to endanger its being broken; directing the handles, and consequently the extracting force, according to the axis of the pelvis—obliquely downwards—not jamming the blades beneath the arch of the pubes; and moving the forceps antero-posteriorly, so as to gain room by farther dilatation. By pressure of the finger, the bladder is prevented from descending along with the stone; or, in other words, counter-extension is made to the extension of the forceps, fixing the bladder, and allowing extraction to be made more effectually than it otherwise would be.

After having passed the prostatic wound, resistance may be offered by fibres of the levator of the anus—insufficiently divided by the incisions; this obstacle may be overcome by the finger also; or it may be necessary to notch the resisting fibres by the edge of a probe-pointed bistoury.

In the case of a number of small stones, the metallic scoop will be found generally preferable to forceps. The instrument is first used as a sound, passed through the wound; the stone having been found, is moved towards the opening in the bladder; and then—if not before—being brought in contact with the point of the forefinger, is withdrawn—steadied on the scoop by the finger's pressure.

Sometimes the stone is lodged above the pubes, and refuses to descend. In such a case, curved forceps are of use; but the difficulty is of rare occurrence. Bent forceps may also be useful, when, in an old man, the stone is lodged in a deep pouch of the bladder, behind a prostate very much enlarged.

The stone may be encysted; a part only projecting into the bladder. The forceps seizing the projection may bring the whole away; if not, it may be necessary—when the part is within reach of the finger's point—to dilate the cyst's orifice slightly, by a probe-pointed bistoury. If the stone be firmly impacted, and not to be loosened safely by the bistoury's edge, the operator must have recourse to expectancy. The wound is occupied by a full sized tube; and during the suppurative stage that follows, it is hoped that the textures may relax, and the stone be disengaged. Then it may be removed in the ordinary way—as has been experienced. Fortunately, however, such a complication is of rare occurrence.

On one occasion, in contending with an encysted or sacculated stone, it was found impossible to seize the stone otherwise than with the coats of the bladder in which it was held. Retaining it thus by the forceps, bringing all down within reach of the finger, and with this pushing back the soft parts gently while the forceps yet kept their hold, the stone was extracted.[1]

Should the calculus break and crumble under the forceps, the scoop will be found well adapted for removing the fragments. And in such cases, to make sure that nothing is left behind, it is well to wash out the bladder. This may be done in two ways; by means of an ordinary enema-syringe, the tube being introduced by the wound; or, by means of a syringe and catheter—the latter introduced by the urethra—a powerful stream being made to issue by the wound; while the patient is placed in a sitting posture.

The stone or stones—readily felt by the finger, forceps, or scoop—having been removed, the Searcher is introduced—a metallic sound, with a large bulbous extremity; and by this each part of the bladder is carefully explored, in order to make sure that no stone or other foreign body remains behind. It is also useful to examine the stones themselves; if one be removed, and found smooth, or hollowed, at one or more points, we may be tolerably certain that there is at least another in the bladder; if, on the contrary, a stone is found rough and unrubbed at all

[1] Monthly Journal, Feb. 1848, p. 574.

aspects, we may conclude that it is solitary. Then a gum-elastic tube is introduced, and retained by tapes fastened to a bandage round the belly; the tube being of length sufficient to admit of one extremity projecting from the outer wound, while the other is lodged in the bladder; and of diameter sufficient to afford a free escape to both blood and urine. The nates having been sponged and wiped, the patient is unbound and lifted into bed; and is there placed with the shoulders elevated, so as to favor outward passage of urine, by sloping the track of the wound. The knees are elevated, and placed slightly apart—supported in the ham, if need be, by a pillow; and an oil-cloth and sponge are comfortably arranged for the reception of urine and protection of the bedclothes. If much pain is complained of, an anodyne is given; and henbane is preferable to opium, being less likely to interfere unfavorably with secretion of urine. The regimen is antiphlogistic for some days; and plenty of diluents are given, so as to favor diuresis; barley water, for example, is taken *ad libitum;* and it may not be amiss to medicate it slightly with the alkaline carbonate, so as to insure the urine being bland as well as plentiful. Copious "wetting" is always a favorable sign; denoting a healthy condition of the kidneys, absence of febrile disturbance, and but slight risk of dangerous infiltration.

The tube is retained, until there is reason to believe that the margins of the wound have become "water-proof," by consolidation and glazing consequent on plastic exudation (*Principles*, 3d Am. Ed. p. 594); the object of this instrument being twofold—the prevention both of urinary infiltration and of accumulation of blood within the bladder. It is also useful in the event of hemorrhage from the deep wound, as will be stated immediately. During the first few hours, an assistant should frequently introduce a quill, or other suitable instrument, for the purpose of preventing occlusion of the tube by coagulated blood; but when the urine is coming clear, this precaution may be dispensed with. No dressing of the wound is necessary until the tube is out; and then simple water-dressing, afterwards medicated as circumstances indicate, is all that is required. When we wish to remove the tube, it is sufficient to cut the retaining tapes; and this may be done after twenty-four hours in the young, but not till nearly twice that time has elapsed in the aged—the plastic process being much more speedy and perfect in the one case than in the other.

After withdrawal of the tube, the wound contracts by the ordinary process of healing. And, after about eight days—sometimes sooner, sometimes later—uneasy sensations are begun to be complained of in the urethra, betokening restoration of its function as to the passage of urine. The first flow by the natural channel is partial, and accompanied with pain; day by day, less and less comes by the wound, and the uneasy sensations in the urethra disappear. Ultimately the wound heals, and all is normally re-established. If any unusual delay occur, it may be necessary to pass a catheter gently; in order to ascertain the state of the urethra, and clear away obstruction if necessary; at the same time inviting the flow to its original course.

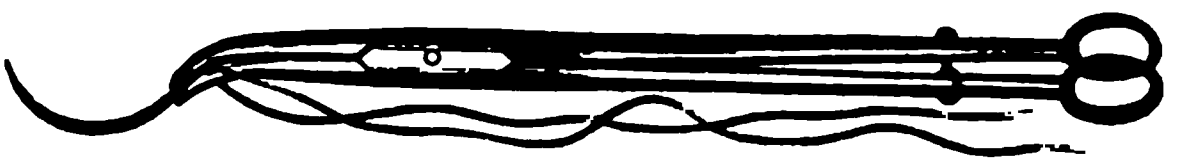
During the after part of the treatment, diet is gradually amended,

as circumstances indicate; the erect posture is resumed, and the patient may be permitted to move about a little, even before the external wound has quite contracted. Such medical treatment, by hygiene, will be continued, as is suited to prevent recurrence of the diathesis on which the stone's formation depended. The operation, in many cases, seems to have the effect, not easily explained, of changing the system wholly in this respect—reproduction of stone, after well-performed lithotomy, being by no means common; yet it is well in all cases, by maintenance of due prophylaxis, to leave no means untried of preventing so unpleasant a relapse.

Such is the usual result of an ordinary and successful case of lithotomy. But there are risks and casualties which now fall to be considered.

I. *Hemorrhage.*—If there be a *transverse artery of the perineum*, of any considerable size, it may be troublesome by bleeding; it cannot be avoided in the incisions; but it can very readily be secured by ligature. By attending to the following circumstances, wound of *the artery of the bulb* will be avoided, when that vessel follows its ordinary course; making the free external incision of no greater depth than the superficial fascia; cutting afterwards on a low level—sloping the main wound obliquely upwards, from the level of the anus to the membranous portion of the urethra; never using the knife but with its back directed upwards; using the finger, to dilate, more freely than the knife to cut, in making the deep wound of the perineum; taking care to enter the knife's point, in the groove of the staff, behind the bulb; and, at this part of the operation, invariably moving the knife from the operator, with its back towards him. If the artery follow an unusual course, it may, perhaps, be detected and avoided; when the operator adopts the safe and good practice, of invariably preceding and accompanying his knife's point with his finger. When the vessel is wounded, three courses are open; to attempt deligation at the cut point—difficult, but not impracticable; to pass an aneurism needle round the trunk of the pudic, on

[Fig. 216.]



[Curved Forceps for holding a bent needle, used by Dr. Physick to pass a ligature around the internal pudic artery.—ED.]

the inside of the ramus of the ischium, securing it by ligature there—also difficult, yet possible; or simply to apply pressure to the vessel in the latter situation, by an assistant's finger placed either in the wound or in the rectum—maintaining such pressure by a relay of assistance, until bleeding has ceased. Veins or small arteries may bleed to excess, in the neighborhood of the prostate—especially in the aged. This form of hemprrhage is readily restrained by pressure; pledgets of lint being introduced firmly into the deep wound, along the tube—and retained, if need be, by a T bandage. This is one of the important uses of the

tube; its presence, as an open conduit for the urine, admitting of such plugging being made, with perfect safety as to the chance of urinary obstruction and infiltration.[1] Arnott's fluid dilator is well calculated to be a successful compressing agent in such bleeding; the open tube occupying the centre of the apparatus, and the compressing fluid consisting of cold water. By cold and pressure it is doubly hemostatic.

Secondary hemorrhage sometimes occurs in the aged, in consequence of asthenic ulceration in the deep wound; this requires ordinary hemostatic treatment by general means (*Principles*, 3d Am. Ed. p. 353).

II. *Peritonitis.*—This is the result of inflammation in the deep wound, extending thence to the coats of the bladder, and from the outer coat passing to the general peritoneum. Or it may be occasioned by violence directly done to the bladder, by forceps or scoop. It is accompanied by its ordinary signs and symptoms; and is amenable to the ordinary treatment—leeching or venesection, calomel and opium, &c. It is obviated by taking care, in dilating the deep wound, not to tear; by not bruising or tearing the vesical coats in any part, through inadvertent seizure by the forceps or scoop; and by never operating while the bladder is in an irritable or excited condition.

III. *Urinary Infiltration* is the most serious risk in lithotomy; and the one of most frequent occurrence. To obviate it, the following points are of essential importance: Maintain the reflexion of the ileo-vesical fascia entire, at the base of the prostate; that gland being not divided throughout its whole extent, by the knife—but rather first notched deeply,[2] and then dilated by the finger and forceps. Make the general wound conical in form; the base at the integument of the perineum; the truncated apex at the prostate. Make the general wound also sloping in form, its fall being from the prostate obliquely downwards—cutting obliquely up to the bladder, not directly into it; also arranging the patient's trunk in bed, so as to favor this sloping form, obviously so well calculated for the ready draining away of the urine. In using the finger in dilatation, avoid all laceration; torn parts being but ill-disposed for rapid plastic exudation. Retain the tube for the necessary number of hours; and keep it clear from coagulum, or other source of obstruction. Farther, the risk by infiltration is certainly diminished, by not operating unless the urinary organs and general system are free from excitement, the kidney acting healthily, and the urine in a satisfactory condition; and also by maintaining, after the operation, a supply of urine which is bland as well as copious—mainly aqueous, and containing but a sparing amount of saline matter. For, if infiltration do occur to some extent, it will be less hazardous to part and system under such circumstances, than if the infiltrated fluid were the acrid and scanty urine of fever or of renal disease.

[1] For obvious reasons, however, it is well to avoid such plugging if possible. The tube, no doubt, averts risk by urinary infiltration; but the track of wound, and especially the neck of the bladder, is not likely to heal so kindly as if no such rough manipulation had been employed. Plugging for hemorrhage always affects the prognosis untowardly.

[2] The notch requires to be tolerably deep, to make sure of dividing the dense inelastic part of the gland, which will not dilate, and the non-division of which would lead to tearing (p. 472).

Urinary infiltration is indicated by the following symptoms: A hot pain is felt in the site of the deep wound, thence creeping up the left hypogastric region, which by and by becomes tender on pressure; the pulse grows rapid and weak—denoting constitutional irritation, not inflammatory fever; the skin is hot and dry; the tongue and lips are parched and dark-colored; the wound is dry and glazed in its edges, afterwards emitting a fetid sanies; and the secretion of urine is in great measure arrested. Ultimately, hiccough comes on, the abdomen grows tympanitic, and the patient is carried off in typhoid prostration. The local changes are—sloughing of the infiltrated areolar tissue, under an asthenic inflammatory process; with thin, fetid discharge.

Treatment is, by the ordinary means, adapted to bear the system through the irritation dependent on such a cause. And if the wound do not seem free and sloping enough, that defect may be remedied by enlargement of the external wound at its lower part. On the first rising of the asthenic action, we may be for some time uncertain whether the case is one of this nature, or peritonitis; and then a sparing application of leeches over the tender hypogastrium is expedient. After infiltration is declared, however, farther spoliation or depression is quite unwarrantable. By some it has been thought advisable to enlarge the wound, and to divide the rectum, at the same time, by the sweep of a curved bistoury; on the principle of freely incising the infiltrated parts, and permitting the noxious fluids a ready outlet.

IV. *Urinary Infiltration and Peritonitis may occur together;* an unhappy combination—known, or at least suspected, by a blending of the signs and symptoms of each. In treatment, it is perplexing to determine whether the one disease shall be more considered than the other. But it is, perhaps, a safe general rule, to award pre-eminence to infiltration; treating it much in the ordinary way; in other words, endeavoring to support the system at all hazards, and hoping to afford it an opportunity of struggling through the inflammatory action.

V. The *Wound may inflame untowardly;* suppurating copiously; perhaps sloughing. This is dangerous to a weak frame, by reason of the grave amount of constitutional disorder which attends, more especially when the deep part of the wound is much affected; the patient may sink under inflammatory fever; or he may afterwards succumb to hectic. The inflammation is obviated by care in the use of the finger and forceps while operating—neither tearing nor bruising; and it is treated by ordinary antiphlogistic means—cautiously, with a view to the coming chance of hectic tendency, under a long open and discharging wound. For the sloughs must separate; enlarging the wound, and necessarily delaying greatly the process of cure.

VI. *Cystitis* is to be obviated, by operating only in a quiet state of the bladder; by avoiding bruise of the prostatic wound; and by using the forceps and scoop with all gentleness, in reference to the coats of the viscus.

VII. *Aggravation of Renal Disease.*—Plain indication of organic disease in the kidney is in most cases held sufficient to contraindicate the operation. But the symptoms of this, obscure and masked, may have deceived the surgeon. In such circumstances, the aggravation

following on the operation will be subdued with difficulty; the patient will in all likelihood perish. But there is another source and chance of escape—by chloroform, as elsewhere stated (*Principles*, 3d Am. Ed. p. 741).

VIII. *Constitutional Irritation* may prove dangerous in one of two forms: 1. As a *Shock;* the immediate consequence of the operation. This may occur to a grave extent, as after other severe operations; and the patient may never rally—death taking place within twenty-four hours, by sinking. And here again chloroform is useful as a means to avert such a casualty (*Principles*, 3d Am. Ed. p. 715). Or *Hectic* may ensue; in consequence of the wound remaining long open, and emitting a copious discharge; as is apt to occur after inflammation of its track in a weakly patient. Then we have to invite restoration of the urethral flow, by cautious use of a catheter; to favor closure of the wound, and diminution of the discharge, by suitably stimulant dressing; and to maintain the powers of the system, by the general treatment adapted for hectic. Sometimes, this state of matters has been found dependent on the presence of another stone within the bladder, preventing closure of the internal wound; overlooked in the operation; or, perhaps, since descended from the kidney. Under such circumstances, it is our duty to dilate the wound, and to obtain extrusion of the stone by the scoop or forceps.

IX. *Erysipelas* may occur; extending from the wound to the nates and thighs, as well as to the perineum and abdominal parietes. It is obviated, by not operating unless the primæ viæ are in a satisfactory condition, and by great attention to cleanliness; maintaining a proper staff of attendants, who keep the patient dry, clean, and as comfortable as circumstances will allow.

X. *The Wound may become Fistulous.*—It may contract to a certain extent, and then remain stationary; a portion of the urine continuing to pass through the fistulous track. This remote result is more troublesome than dangerous. The urethra will most probably be found at fault, obstructed in some part of its course by former stricture, or by recent swelling; and the catheter or bougie has to be used accordingly. After due clearance of this canal, the perineal fistula will probably close. If not, it is to be treated as obstinate fistulæ usually are; by application of a hot wire, at long intervals (*Principles*, 3d Am. Ed. p. 221).

Rectal fistula sometimes results by wound of the bowel at the time of the operation; or it may be caused more remotely by ulceration. The aperture may close with the rest of the wound. But not improbably it remains open; feces finding their way upwards into the track of the general wound, and urine passing into the rectum. Such a casualty is obviated by care, during the operation, in interposing the left forefinger between the knife and the bowel, and always using the former most cautiously. Treatment consists in dividing the coats of the bowel up to the aperture, as in fistula in ano; but this is not done at once; an opportunity is first afforded for spontaneous closure.

Such are the more important and ordinary dangers and difficulties which attend this operation. We are constantly liable to meet with

others, however, which can scarcely be brought under any categorical arrangement; and yet for them the surgeon must be at all times prepared.[1]

The operation of lithotomy, in itself difficult, beset with many dangers, and implicating important parts, cannot be expected to prove very highly successful, even in the most skilful hands. The average proportion of deaths hitherto, in the general practice of surgery, may perhaps be stated at one in five or six. But as our science and art advance, it is to be hoped that the result will rise proportionally. Some individual operators have attained to pre-eminent success in this department; a pre-eminence apparently due, partly to operative dexterity and skill, partly to careful and judicious treatment both before and after the operation, partly to a wise selection of cases. The age of the patient has much to do with the prognosis. In childhood, recovery is the rule, death the exception. And the hale old man is more favorably situated than the robust and young adult. As a general rule, however, the chances of recovery diminish with increase of age, as well as with increase of size in the stone.[2]

Varieties in Lithotomy.

In young children, the operation may be done with a common scalpel. And it is essential to remember that in them the bladder rises comparatively high. The rectum is then the predominant viscus of the pelvis; and great care must be taken accordingly not to injure it by the knife. The patient may be exempted from deligation; held firmly on an assistant's knee.

The Bilateral Operation.—When the stone is known or suspected to be of large size—too large to pass through the ordinary single wound of the prostate, but not too large to pass through the outlet of the pelvis easily—the wound is made *bilateral*, as has already been explained (p. 473). But such bilateral section seems quite unnecessary in ordinary cases.

If, unfortunately, the surgeon have been deceived as to the bulk of the stone; and, after having made his bilateral section with perineal wound, finds that the stone is too bulky to pass, even were it out of the bladder, he must either proceed to the high operation or attempt to break the stone, and extract it piecemeal through the perineum. The *crushing* instruments, necessary in such circumstances, need not be described. They are to be found in cutlers' shops, and in the armamentaria of most lithotomists; but, fortunately, are seldom, if ever, called into exercise. The simplest form of instrument is probably the best; strong forceps, the blades armed with teeth, and the handles ap-

[1] I had occasion to operate in a case thus complicated; the outlet of the pelvis was narrow; the perineum was deep; a cyst existed on the lateral exterior of the prostate; at least two round and distinct medullary tumors projected from the neck of the bladder into its interior; the stone proved large, weighing six ounces and a drachm, and measuring nine inches and a quarter in its largest circumference. The patient sank on the fifth day, under symptoms of infiltration. The deep wound was more free and uncertain than I could have wished, and the operation was necessarily tedious.

[2] Vide *Monthly Journal*, Nov. 1847, pp. 325 and 326.

proximated by a powerful screw. The operation *a deux temps*—cutting into the bladder one day, and attempting to extract the stone on another, during suppurative relaxation—is wisely abandoned, unless in the case of obstinately encysted stone, already alluded to (p. 474). In no other circumstances is such a plan of operation voluntarily adopted; but it may be thrust upon an operator by the stern force of circumstances.

The *gorget*, too, is but little used in the present day. For the blunt gorget, the operator's forefinger of the left hand is a very superior substitute, as a guide and conductor of forceps into the bladder. And the cutting gorget, however modified, can never be so certain or so safe as a knife's point, guided and controlled as we have endeavored to describe.[1] In the hands of the careless or inexperienced, a cutting gorget may be the cause of frightful accident. Pushed recklessly on, it is as likely to be out of the bladder as in it. It may pass—has passed—between the bladder and os pubis, pushing up, bruising, detaching, or tearing the peritoneum; or between the bladder and rectum, as has more frequently been the case; in either way favoring the most hazardous infiltration, and perhaps combining this with peritonitis. It has happened, indeed, that by a more heroic thrust the bladder has been completely perforated, the intestines have protruded, and after death the lobulus Spigelii in the liver has been found wounded!

The *Recto-vesical* operation is also out of date. It was supposed that, by cutting through the rectum, and thence reaching the posterior part of the bladder uncovered by peritoneum, less hazard would be incurred of peritonitis, hemorrhage, or infiltration. But the misery and even danger of a foul fecal fistula remaining, was found by much to outweigh the supposed safety of the procedure. Under certain circumstances, however, such an operation may be thrust upon us; as in the case narrated by Mr. Liston, where a large stone was found encysted in the posterior part of the bladder, and bulging into the rectum. In that case after the ordinary opening had been made into the bladder, it was found impossible to dislodge the stone without division of the anterior wall of the cyst; and that could not be accomplished, without incising the corresponding portion of bowel. Then the stone was readily extruded.[2]

The High Operation.—When a stone is deemed too large to pass with safety through the outlet of the pelvis, by the perineum, it is to be sought for above the pubes. By a blunt staff, introduced along the urethra, the fundus of the bladder is elevated as much as possible in the pelvis, so as to enlarge the space uncovered by peritoneum on the lower and anterior aspect. A suitable wound is made through the abdominal parietes; entering the knife immediately above the symphysis pubis, and carrying it upwards as far as seems necessary; cutting layer after layer, cautiously, until the vesical coats are reached. At the lowest part of the wound, these are punctured; and, the finger having been

[1] Gorget-like knives have been invented for the purpose of rendering the prostatic wound very exact in its limits. But after trial they have been laid aside, as inferior to the ordinary knife guided by the finger.

[2] Liston's Principles of Surgery, 2d edition, p. 657.

introduced into the bladder, the aperture is enlarged to the requisite extent. The stone is seized by forceps, and removed. The wound is brought together, having a short tube—or a slip of lint, siphon-like—at the lower part, by which the urine may pass readily away, and infiltration be avoided. To aid in this indication, the patient is laid on his side; and perhaps a flexible catheter may also be passed by the urethra, and retained. But with every care, it is difficult to prevent this grave accident—so likely to occur from the non-dependent nature of the wound. And, consequently, the results of this operation are not found to be very encouraging.

Recently, an important modification has been suggested; the premising of a perineal puncture; a track of wound resembling that of lateral lithotomy, but on a smaller scale; the internal opening implicating the membranous portion of the urethra only. Through this puncture the elevating blunt staff is introduced, and may be worked more efficiently than from the urethra. After removal of the stone, a common lithotomy tube occupies the place of the staff in the perineal wound, and is retained for some days, the urine passing readily through it—the patient's trunk being slightly raised to assist in this. The suprapubal wound is brought accurately together throughout its whole extent, and union by the first intention hoped for. And thus the operation may be not only simplified in performance, but also the great danger by infiltration may be effectually avoided.

Lithectasy.—Another recent proposal is the substitution of lithectasy for lithotomy; that is, wound of the membranous portion of the urethra, and gradual dilatation of this—for wound of both this and the prostatic portion, dilatation and extraction following immediately. The operation is simple and probably safe. Lithotomy is performed on a small scale; or a puncture is made in the central space of the perineum, above the anus. The membranous portion of the urethra is reached and opened. No attempt is then made to reach the bladder and stone by the finger, but the wound is occupied by sponge-tent, or by Arnott's fluid dilator; and thereby dilatation is effected more or less rapidly. In the course of twenty-four hours, the space may be expected to be suitable for introduction of instruments, and for removal of a small stone—the neck of the bladder being left undivided, and the great hazard by infiltration being almost certainly avoided.[1] But the manifest objection to this proceeding is, its slowness and uncertainty. Under tedious and painful dilatation the patient is very liable to suffer serious irritation, both mental and bodily; and a susceptible frame may be irreparably injured thereby. Also, after the allotted period of painful probation has passed, the space may be found insufficient; the dilator has to be resumed, or the knife is employed; and, in any way, danger is incurred. Farther experience is yet required, ere the merits of this operation can be finally determined. But at present one naturally inclines to think that it can be applicable only to small stones; and that these may be better dealt with by lithotripsy.

[1] Willis on Stone, p. 160.

Palliation of Vesical Calculus.

We are called upon to palliate the symptoms of stone, irrespective of any operation, when the patient refuses to submit to this, or when the circumstances of the case obviously contraindicate its performance. If the patient is very far advanced in years, and suffers comparatively little from the stone, we decline to operate. When the patient is aged, and afflicted with great enlargement of the prostate—perhaps malignant—we cannot expect a successful issue; and the operation can scarcely be looked upon as a likely means towards Euthanasia. When the kidneys evince organic disease, by albuminuria, renal pain, constitutional disorder, purulent urine, &c., we cannot expect but that the operation will cause renal aggravation and death. In these cases, therefore, and such like, we content ourselves with palliating what we cannot cure. All violence and imprudence in exercise and regimen are avoided; the bowels are gently regulated; by alkaline or acid remedies internally, the condition of the urine and of the bladder is hoped to be amended; and by opiates, by the mouth or anus, pain is assuaged. When the phosphatic diathesis is not strongly marked, nothing proves more efficacious than weak doses of the alkaline carbonates much diluted.

Urethral Calculus.

Calculus in the urethra is sometimes original; foreign matter having been in some way introduced from without, and calculous deposit concreting on this as a nucleus. Much more frequently, however, it is secondary; a vesical calculus having been arrested in its progress outwards. It may be simply impacted in the canal, which dilates behind it; or it may become imbedded in a cyst or cavity—sometimes formed of the urethral parietes, sometimes of condensed areolar tissue exterior to these. In the latter case, the symptoms may be slight; there being little obstruction to the flow of urine. Impaction in the canal, on the other hand, causes much distress, by pain, frequent desire to make water, and imperfect ability to obey the call. If obstruction is complete, serious danger by retention of urine ensues. The calculus, when situated anteriorly, may be felt by manipulation in the course of the urethra.

Treatment varies according to circumstances. 1. If the stone be of considerable bulk, and arrested at the posterior part of the canal—and more especially if retention of urine exist—a catheter is to be introduced, by which the stone is dislodged, and pushed back into the bladder. There it can be afterwards dealt with by Lithotripsy. 2. If the stone be small, and situated anteriorly, it is to be brought to the orifice of the urethra, and thence extruded. Such forward movement may be effected by the fingers simply. Or a loop of wire may be insinuated past and behind the stone; and thus it may be extracted, like a cork out of a bottle. Or it may be seized by small dressing forceps; or more readily, by Hunter's forceps. Or a bent probe may be passed behind, and by it extrusion may be effected, as in the case of foreign bodies lodged in the nose or ear. 3. But the stone may be fixed, and

not inclined to move in any direction. Then it is to be cut out. If situate in the prostatic or membranous portions, the operation of lithotomy on the gripe may be had recourse to (p. 469). The fingers of the left hand, passed into the rectum, push the stone forwards on the perineum; and there, through a semilunar incision made across the raphé, above the anus, it may be extracted. Or, lateral lithotomy may be performed on a small scale. And in having recourse to this latter operation, for a stone of some size, lodged in the prostatic portion of the urethra, and long resident there, it is well to remember that considerable alteration may have taken place in the bladder. It may have contracted completely on the stone; the ends of the ureters abutting on this, and there being no cavity beyond; the urine coming away constantly, by stillicidium. If a stone be found already in the perineal portion of the urethra, it is to be removed through a direct incision, made in the centre of the raphé. If one present itself anterior to the scrotum, it is well not to excise it there; for, wounds in that situation are slow to heal, and apt to degenerate into troublesome fistulæ. By manipulation let it be brought behind the scrotum—if it refuse to advance to the orifice—and there let it be excised, through a deeper but more manageable wound. Not unfrequently a calculus, after having passed all the rest of the urethra, with more or less suffering to the patient, is arrested at the orifice. Thence forceps, or a bent probe, may remove it. But if such difficulty be experienced in the attempt, as to threaten laceration of the parts, let an incision be made to dilate the orifice, by means of a narrow probe-pointed bistoury; and then extrusion will be simple and immediate. 4. Sometimes a calculus, lodged in the urethra, works its way out by ulceration and abscess; presenting itself in the perineum or scrotum; a tedious and unsatisfactory process, not to be wished for, or trusted to in treatment. [5. Frequently, the fragment or the entire calculus may be broken to pieces by a drilling process. For this purpose, an instrument like Civiale's three-bladed lithontriptor, but smaller, may be employed. It consists of a canula inclosing a steel rod which terminates in a three-pronged forceps, and which is perforated by another rod, the extremity of which is sharp and hard for drilling. The forceps is

[Fig. 217.]

[Instrument for catching and breaking Calculus in the Urethra. (From Fergusson.)—Ed.]

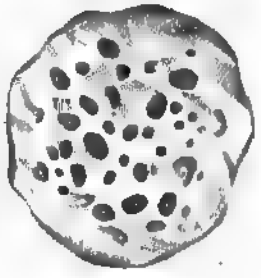
closed by pushing the canula over the blades, which open again so soon as the canula is drawn back; the drill is worked by simply turning it with the hand, or, if necessary, with a bow. When the forceps is completely closed, the instrument resembles a straight catheter; it is introduced in this condition until it touches the stone; then the canula is withdrawn, the forceps expands, and by a little management is made to inclose the calculus; the canula is again thrust forwards, the stone secured, and the drill speedily breaks it to pieces small enough to escape by the urethra.—Ed.]

Preputial Calculus.—When the prepuce is congenitally long, and of tight orifice, and when the patient labors under calculous diathesis, a concretion may form exteriorly to the urethra, within the cavity of the prepuce; the urine being in some proportion retained there, after micturition, and having opportunity thus afforded for deposit. The symptoms are most manifest; painful and frequent micturition; congestion of the parts; the stone to be felt by manipulation, and also on introduction of a probe through the narrow preputial orifice. Treatment is simple. By a curved bistoury the prepuce is divided on its lower aspect; and by this simple incision two evils are at once remedied; the stone is dislodged, and the condition of phymosis is removed.

Prostatic Calculus.

The term *Prostatic* is not applied to a vesical calculus, which, in its passage outwards, has been arrested in the prostatic portion of the urethra; but is properly limited to those concretions which form in the ducts of the prostate gland. They are of small size, brown, smooth, and sometimes numerous; and consist of phosphate of lime, sometimes mixed with carbonate of lime, deposited from the secretion of the ducts. They produce more or less irritation at the neck of the bladder; especially after the bladder has been emptied. When they project into the canal, a sensation of rubbing may be felt when a sound passes over them. And, if in numbers, they may be felt sliding on each other, by a finger introduced into the rectum, and pressing upon the part. Whatever tends to vitiate and retain the secretion of the ducts, tends to the formation of such concretions. Hence they are generally met with in cases of tight stricture of the posterior part of the urethra. The ordinary result is one of two events. The calculus, reaching the orifice of the duct, drops back into the bladder, and may be either extruded thence, or remaining may constitute the nucleus of a vesical concretion. Or the stone or stones remain in the substance of the gland; perhaps leading to abscess and disorganization.

[Fig. 218.]



[Prostatic Calculi. (From Gross.)—Ed.]

In the case of small projecting calculi, they may be dislodged by the end of a catheter; to be afterwards passed by the urethra, or to be ground by lithotripsy. And in the great majority of cases they may be passed readily enough, if no unnatural obstruction exist in the urethra. When numerous calculi lodge in the gland, a small lithotomy may be had recourse to—an operation, however, which is very seldom required.

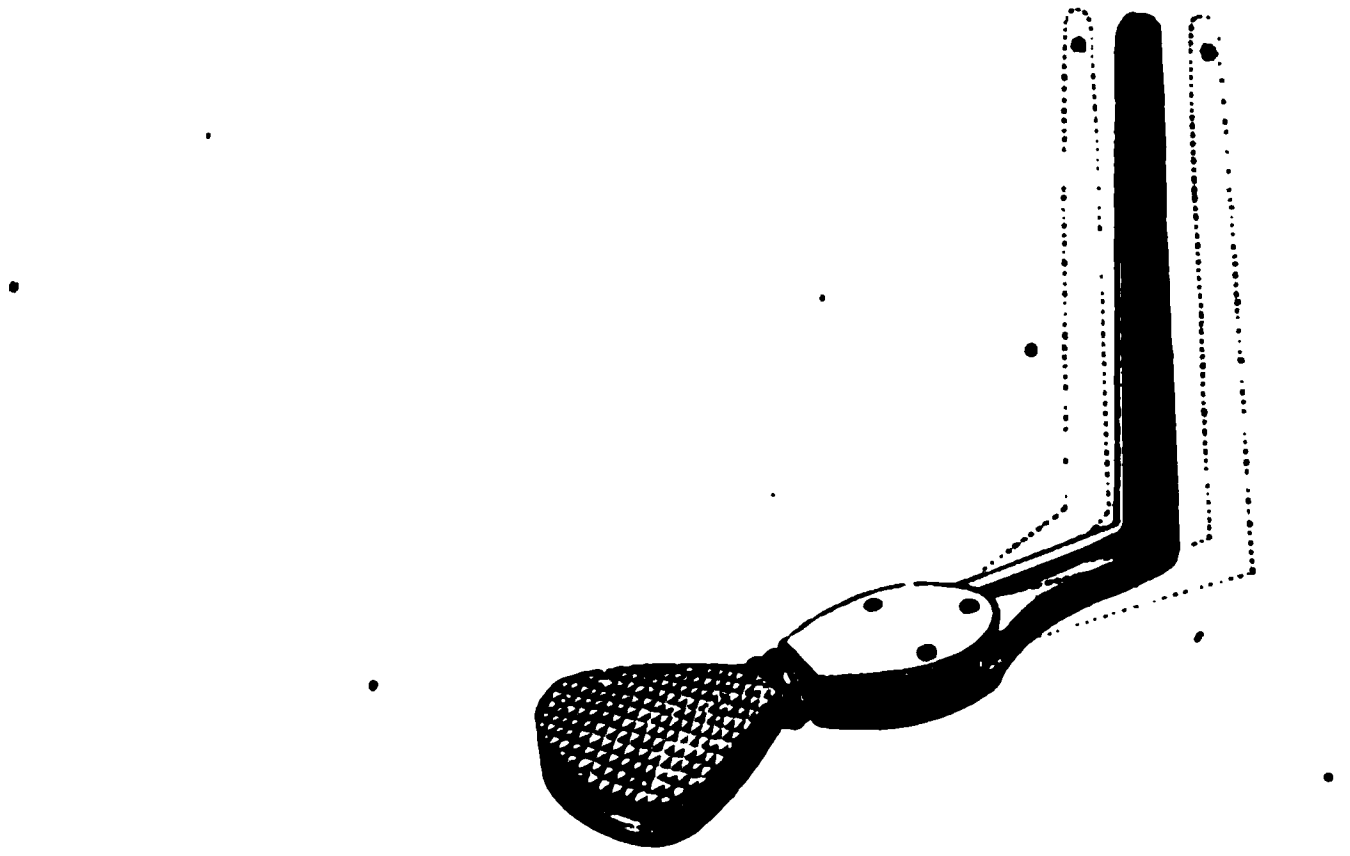
Calculus in the Female.

As already stated, urinary concretions are comparatively rare in the female; for two reasons; because the calculous diathesis is less common;

and because, the urethra being short, capacious, straight, and well-flooded, extrusion of renal formations is more probable than their retention. Nuclei are not unfrequently afforded, however, by the introduction of foreign matters from without; and these substances may be of bulk and form not favorable to extrusion under any circumstances; bodkins, pencils, glass stoppers, coal, sandstone, &c.

When a stone does form, and remains, the symptoms it occasions are quite analogous to those in the male. Perquisition is made by a short, straight, steel staff, slightly curved at the extremity. And a stone, having been found, may generally be got rid of without incision. The urethra admits of great dilatation; and if this be done gradually, but little pain is caused. Sponge-tent, Weiss's metallic dilator, or

[Fig. 219.]



[Weiss's Metallic Dilator; the black lines show the instrument closed: the dotted lines represent the blades expanded by turning the screw, which is connected with the handle. (From Fergusson.)—Ed.]

Arnott's fluid dilator, may be employed. And a sufficiency of space having been so obtained, forceps or a scoop are introduced, and the stone removed. The risk is, that, in consequence of the dilatation, power of retention may be seriously impaired, and more or less inconvenience by incontinence of urine may result.

Lithotripsy was at one time supposed unsuitable to the female; but experience has shown that it is fully as applicable as to the male—the shortness and amplitude of the urethra favoring, indeed, the introduction and efficient play of the instruments. Subsequent expulsion of the fragments, too, is more easy and safe.[1]

If the stone be found of larger size than to pass by dilatation alone, and if lithotripsy should not be considered advisable, the knife is to be used—sparingly. A straight staff is introduced; on it a probe-pointed straight bistoury is passed; and the urethra is notched, upwards and outwards, on each side—the knife's edge being chiefly applied at the

[1] Civiale, Traité Pratique et Historique de la Lithotritie, Paris, 1847.

neck of the bladder. Dilatation is then resumed; and extraction effected.

A stone has made its spontaneous exit from the female bladder, into the vagina, by ulceration.

Sometimes calculous matter collects at the lower part of the orifice of the female urethra; forming a concretion of greater or less size, which becomes imbedded in a partial dilatation of the canal—bulging into the vagina. The urine passes over it, freely but painfully; it may produce most of the ordinary symptoms of stone; yet, from its lateral and sacculated position, it may be overlooked in the introduction of a sound. It is a good rule, therefore, in cases of suspected stone in the female, to direct our attention to this part, after the bladder has been explored unsuccessfully.

Wollaston on Cystic Oxide, &c. Phil. Tr. vol. c. p. 223, Lond. 1810. Marcet on the Chemical History and Medical Treatment of Calculous Disorders, Lond. 1817. Sanson, Des Moyens de Parvenir à la Vessie par le Rectum, &c. Paris, 1817. Prout on the Nature and Treatment of Gravel, &c. Lond. 1818. Arnott, Essay on the Different Modes of Extracting Stone, &c. Lond. 1821. Key on Section of the Prostatic Gland in Lithotomy, Lond. 1824. Dupuytren, sur l'Opération de la Taille, Paris, 1826. Deschamps, Traité Historique et Dogmatique de l'Opération de la Taille, Paris, 1826; Dupuytren, Sur une Manière Nouvelle de Pratiquer l'Opération de la Pierre, par Sanson et Bégin, Paris, 1836. Souberbielle, Observations sur les Opérations de Cystotomie Suspubienne, &c. Paris, 1828. Heurteloup, Principles of Lithotrity, &c. Lond. 1831. King, Lithotomy and Lithotrity Compared, Lond. 1832. Crosse on the Formation, Constituents, and Extraction of the Urinary Calculus, Lond. 1835. Willis on Urinary Diseases and their Treatment, Lond. 1838. Civiale, Traité de l'Affection Calculeuse, Paris, 1838; also Traité Pratique et Historique de la Lithotritie, Paris, 1847. Brodie, Lectures on Diseases of the Urinary Organs, Lond. 1842. Bence Jones on Gravel, Calculus, &c. Lond. 1842; also Animal Chemistry in its Application to Stomach and Renal Diseases, 1850. Scharling on the Chemical Discrimination of Vesical Calculi, translated by Hoskins, 1842. Garrod, Lectures in the Lancet, 1849. Prout on the Nature and Treatment of Stomach and Renal Diseases, &c. Lond. 1849. Golding Bird on Urinary Deposits, Lond. 1851. [Gross, Diseases and Injuries of the Bladder, Prostate Gland and Urethra, Philad. 1851.—Ed.]

CHAPTER XXXI.

AFFECTIONS OF THE BLADDER.

Cystitis.

THE inflammatory process, attacking the bladder, may be acute or chronic; and either form constitutes a formidable disease. *Acute Cystitis* may be the result of direct injury; as in Lithotripsy or Lithotomy. Or it may be a continuation, or a metastasis, of inflammatory action elsewhere; as in gonorrhœa. Or, it may be of idiopathic origin. Or, it may follow the use of internal irritants; as cantharides. Most frequently, it is the consequence of virulent and ill-treated gonorrhœa. The symptoms are: pain in the region of the bladder, and also referred to the perineum and sacrum, sometimes stinging along the urethra; tenderness over the pubes; the urine voided very frequently, with great pain and straining—the pain being greatest after the bladder has been emptied; the urine at first clouded with mucus, afterwards puriform in character; sometimes, after the urine has passed, a small quantity of puriform matter is expelled with much suffering; often the urine is mixed with blood; sometimes, after scanty and turbid urine has passed, pure blood escapes, in drops, or other small quantity. The system is involved in smart sympathetic fever. The action may extend by the external coat of the viscus, and general peritonitis result.

Spasm may simulate most of the symptoms; but is known by absence of inflammatory fever, and by the character of the pain—which, in spasm, is sudden in its accession, not gravescent, rapid in its disappearance, and may be intermittent (*Principles*, 3d Am. Ed. p. 121).

In the treatment of acute cystitis, antiphlogistics are to be plied actively. Blood is drawn from part and system; fomentations and the hip-bath are used; antimony, and if need be, calomel and opium are given; opium, by the mouth and rectum, is usually indispensable—after bleeding—to subdue pain; and the recumbent posture must be rigidly enjoined. This last indication is indeed imperative, in the treatment of all inflammatory affections of the bladder; the erect and semi-erect postures tending obviously to favor determination of blood to the pelvic organs. The bowels are to be relieved by enemata, aided by the gentlest possible laxatives; so as to avoid straining. During convalescence, the urine will probably require a special treatment; varying, according as that fluid evinces an acid or an alkaline character.

Chronic Cystitis, or *Catarrhus Vesicæ*, is generally symptomatic of some other affection; of gleet; of stricture; of enlarged prostate; of

stone in the bladder; of hemorrhoids, or other disease of the rectum; of renal irritation. Sometimes, however, it is idiopathic. Micturition is frequent and painful, and the urine contains much viscid mucus. Often the recipient vessel seems almost entirely filled with mucus, thick, glutinous, and very adherent to the bottom. At first, it is grayish and streaked; the streaks dependent on phosphate of lime; afterwards it becomes brown, ammoniacal, and intensely fetid. Not unfrequently there is admixture of pus; sometimes of blood. The mucous membrane is thickened and congested; it may ulcerate; the muscular coat is hypertrophied, and may sacculate; the kidneys are sooner or later involved. By ulceration, it has happened that a communication between the bladder and rectum has been formed. Also, the fundus has become perforated into the sigmoid flexure of the colon; constituting an entero-vesical fistula. The system is always affected more or less. And this is the diagnostic between catarrh, and mere irritability of the bladder. In the latter, the system is free; in the former, it is always involved, and, in general, seriously.

In treatment, little benefit need be looked for, unless the obvious cause, when it exists, be removed. Stricture must be cured; stone must be taken away; the rectum must be restored to a healthy state. Disease of the kidney and of the prostate may be palliated, but are not always curable. For the disease itself, opium is of great service; allaying irritation, and lulling inordinate action. The buchu, pareira, and uva ursi, with mineral acids, are useful, as in alkaline urine from other causes. Regimen is generous, rather than otherwise; to support the system. There is no tolerance of either purging or bloodletting. Iron often is of great use; and perhaps the best form is the tincture of the muriate. From a combination of benzoic acid with copaiba, relief sometimes results. And counter-irritation is often of the greatest service; on the hypogastrium, or over the sacrum—the latter the preferable situation—unless, indeed, there be already too much irritation there, in the form of bed-sore. In severe cases, the actual cautery may be warrantable; to a very limited extent, however; there being no tolerance in the system of the exhaustion and irritation of a large suppurating surface.

The following are some of the principal remedies: Opium in full doses, and repeated, so as to overcome pain and irritation. If opium disagree, hyoscyamus may be substituted. Of the mineral acids, the dilute muriatic and nitric are usually preferred; in doses of eight or ten drops, gradually increased. The pareira is given in decoction. Half an ounce of the root, in three pints of water, is boiled down to one pint; and of this, from eight to twelve ounces may be taken daily; or it may be given in the form of extract, to the extent of twenty or thirty grains daily. Of the buchu and uva ursi, in the form of strong infusion, ounce doses are given three or four times a day. The tincture of the muriate of iron is administered, in doses of from eight to fifteen drops twice daily. A drachm of benzoic acid, with half an ounce of copaiba, made into an emulsion with camphor mixture, may be taken in ounce doses, in the course of forty-eight hours.

The milder cases yield to such remedies. The more severe probably

do not. In them, other measures must be had recourse to, and the most promising is injection of the bladder, never to be employed, however, except in aggravated cases, and after ordinary means have failed, otherwise it may itself prove the source of no inconsiderable injury. It is also essential that no acute or subacute exacerbation be present; the disease must be thoroughly chronic. The injection is at first detergent and soothing, water, or a decoction of poppies. Then a mixture of ten minims of dilute nitric acid with two ounces of distilled water is thrown in, and allowed to remain about thirty seconds. In two days the injection is repeated, and the dose of acid is gradually increased; by and by the injection may be given daily, not oftener.[1] In extremely chronic cases, the bladder may be thoroughly washed out by means of a double catheter, to the main orifice of which a small enema-syringe is adapted, and by means of which apparatus a strong and continuous current is established in the viscus. Should at any time pain or even uneasiness follow the use of this means, however, the practice must be discontinued.

In very obstinate cases, it may perhaps be allowable to make a cautious trial of the application of nitrate of silver, in substance, to the mucous coat, as proposed by M. Lallemand. The bladder having been emptied, the porte-caustique is passed, and the stylet having been pushed forwards, a momentary contact of the nitrate of silver with the lining membrane is permitted. The instrument is then withdrawn, and a portion of the caustic, dissolved in mucus, pervades the viscus. This is to be done very warily, and the after consequences must be anxiously watched, lest overaction ensue.

Irritable Bladder.

In healthy states of the urine and bladder, the stimulus of the former operates on the latter only according to quantity; a certain amount of fluid having accumulated, an uneasy sensation is felt, and the bladder contracts in obedience to that stimulus, seeking relief thereby. If the urine be abnormally acrid, however; if the mucous membrane of the bladder be morbidly sensitive; or, more particularly, if both these states exist together—the ordinary stimulus of the urine is found to be intolerable, and frequent, uneasy micturition results, constituting the affection termed Irritable Bladder. Pathologically, it differs from any form of cystitis, in depending on irritation, and not on the inflammatory process; there is not necessarily any structural change in the coats of the bladder. Practically, it is known by the absence of grave constitutional disorder, as well as by the absence of profuse secretion of vitiated mucus, the prominent characteristics of Catarrhus Vesicæ. No doubt, however, these affections may and do, not unfrequently, coalesce, the irritation inducing inflammatory action, and becoming merged therein. Concussion and compression of the brain are often associated, yet are regarded as distinct affections (p. 46), and so here.

The symptoms of Irritable Bladder are: frequent micturition, with uneasiness rather than actual pain; the desire is almost constant, the

[1] For farther details of the *loiura vesicæ*, see *Monthly Journal*, May 1850, p. 482.

slightest quantity of accumulated urine proving an unnatural stimulus to the irritable mucous coat, and relief is obtained on evacuation being completed. The pulse and general system are comparatively unaffected. The urine may be limpid and clear, frequently it is clouded by mucus, not unfrequently it furnishes deposit of the urates. The cavity of the bladder is contracted, but not necessarily with structural change. In some cases, the coats have been found thinner than in health. The source of irritation may be in the mucous coat itself. More frequently it is elsewhere—affection of the kidney, in phosphatic or oxalic diathesis, for example; ascarides, hemorrhoids, or other disease of the rectum; calculus, or other irritation in the urethra. In children, it not unfrequently depends on a contracted state of the preputial orifice. Most frequently, the affection is found to originate in derangement of the kidney and of the general health; and this at once gives the two component parts, the acridity of urine, and perverted sensibility in the mucous coat. Indeed, these morbid states very seldom are separate, for if irritation commence in the bladder, it is thence extended to the uro-poietic system, and derangement of secretion necessarily follows.

Treatment consists in looking for a cause, and in removing it, if possible, amending the stomach, bowels, and general health, and restoring the urethra, rectum, and other parts to a sound state. By anodynes, given by both mouth and anus, but especially in the latter way, the irritation is subdued. And, throughout, a constant regard is had to the state of the urine. The small doses of alkali, largely diluted (p. 461), are often found very serviceable. Recumbency is advisable, at all events in cases of severity. And should these simple means fail, recourse is had to smart counter-irritation, by blistering above the pubes, or over the sacrum.

Mental anxiety induces a temporary simulation of this disease; or, perhaps, it may be said to cause a variety of it. The mucous coat is increased in sensibility, and the whole frame is in unwonted excitement. The urine is not acrid; on the contrary, it is copious, pale, aqueous, and bland; and stimulates by quantity, rather than by quality. In this case, hyoscyamus and other direct sedatives are all powerful; together with attention to the manifest cause of the disorder.

Hæmaturia.

By this term is understood spontaneous discharge of blood from the urethra. It may proceed from different sources. 1. *From the Kidney.*—Stone in the kidney is often accompanied by discharge of blood from the mucous membrane in contact with the stone; more especially after violent exercise, error in diet, or other source of aggravation in gravel. Blows on the renal region cause hæmaturia; the blood in such a case sometimes passing in large quantity. Occasionally, the occurrence takes place without any assignable exciting cause, in cases of structural disease of the organ.

The renal source of the hemorrhage is known, by the blood being diffused equably through the urine; by the expelled fluid containing cylindrical portions of fibrine, like small worms, the result of coagula

in the ureter—sometimes colorless, sometimes of a pale pink hue; by the appearance of blood being preceded and accompanied by pain and heat in the loins, and other renal symptoms;—and more especially when such symptoms are present on one side only.

Treatment consists in such means as are best calculated to remove the cause. In the case of external injury, rest, fomentation, low diet, leeching if necessary. In the case of stone, the palliative or more thoroughly remedial measures, which we have already seen to be suitable in this disease. In the idiopathic hemorrhage, connected with a generally relaxed state of system, and threatening exhaustion by continuance, such remedies as are useful for passive hemorrhage—more especially rest, local application of cold, and internal use of gallic acid.

2. *From the Bladder.*—This is the most frequent variety; as already seen, a very constant attendant on vesical calculus; and then liable to be aggravated by circumstances. It may also proceed from a congested or inflamed state of the mucous membrane, unconnected with the presence of any foreign body. More or less, it is common in cystitis. From ulceration of the mucous coat it cannot fail to occur. But perhaps the most frequent source, next to that of calculus, is enlarged and ulcerated prostate. And if this state coexist with calculus, the loss of blood is likely to be both large and frequent. Malignant tumor of the bladder, as it ulcerates, must furnish blood; and a large amount may flow from injury done to the coats of the viscus, by ill-managed catheters, bougies, or lithontriptors. Worms lodge in the bladder; sometimes, though rarely; and they have been known to occasion profuse and even fatal loss of blood.

Vesical hemorrhage may be so profuse as to furnish blood tolerably pure from the urethra. And, in general, this variety of hematuria may be known, by the blood not being mixed with the urine; the latter fluid passes off first, tolerably pure; and the blood comes last, more or less changed by mixture with the residue of the urine. It is also known by the absence of renal symptoms; and by the presence of undoubted signs of stone in the bladder, or other disease of that viscus, or of affection of the prostate. In the case of direct injury done to the bladder by instruments, there need be no room for doubt. Treatment, varying according to the cause, is plain and obvious, and need not be particularized.

Sometimes blood escapes in large quantity—in the case of stone, or enlarged prostate—and accumulates in the bladder; coagulating, and causing retention of urine. A hard tumor is felt in the hypogastrium; the ordinary distressful signs of retention are all present; on introducing the catheter, only a small quantity of bloody urine passes off; the fibrinous clot may be felt plainly enough, on moving the instrument's point; and, on withdrawing the catheter, it is found more or less obstructed by coagulum. If the symptoms be not urgent, we may content ourselves with occasional introduction of the catheter, to remove what loose fluid there is; the coagulum gradually dissolves in the urine, and comes away. If urgency exist, however, it is advisable to inject a small quantity of warm water; and then, by the exhaustion of a powerful and well-fitting syringe, to endeavor to break down and remove at least some

of the clot. In the case of spontaneous disruption of stone, attended with such complication, it is expedient to have instant recourse to lithotomy, provided the state of system be found sufficiently tolerant of such a severe proceeding (p. 457).

3. *From the Urethra.*—In this case there is absence of both renal and vesical symptoms; the blood passes pure, irrespective of any desire to evacuate the bladder; and there is usually some plain cause for the accident—as injury, inflammatory action, erection in chordee, or excessive venereal excitement. The application of cold, with recumbency, usually suffices for arrest. In extreme cases, following chordee, pressure may be made on or near the orifice, and at the perineum; so as to include the source of bleeding between the two compressed points—preventing escape in either direction, and converting the effused blood into its own hemostatic. In the case of wound, the ordinary principles of surgery are put in force.

Enuresis, or Incontinence of Urine.

Practically, this affection may be divided into that which affects the adult and the aged, and that which occurs in children. In the former, one of two events has taken place. Retention of urine has occurred; the bladder has become greatly distended; and the recently secreted urine, finding no room in that viscus, dribbles away slowly and involuntarily by the penis. In other words, incontinence in this case is but a symptom of a more serious affection—retention of urine. Or, as more frequently happens in the aged, the parts have simply lost their tone; the expelling power is small, while the retaining power is almost or wholly gone; and the urethra is little more than a passive tube, through which the urine flows outwards, shortly after secretion. In the former case, treatment is by the use of the catheter; directing our attention to the true disease—retention.[1] The other form is regarded as but one of the many signs of senile decay, and treated accordingly. Temporary relief may in some cases be afforded, by the internal use of nux vomica, or strychnia; a degree of tone being restored to the parts for a time. But, in general, we have to content ourselves with attention to comfort and cleanliness, by the wearing of urinals adapted to the circumstances of the case.

In the adult, incontinence of urine sometimes follows rheumatic or other fevers; it may also result from injury of the spine; and it is an ordinary symptom of the slow degeneration of the spinal cord formerly spoken of (p. 333). Nux vomica, or strychnia, cantharides, and tincture of the muriate of iron, with blistering over the sacrum, are the most likely means of benefit. In some cases, the application of electricity to the parts affected has been of service. The remedies are plainly of that class which tend to restore muscular and nervous energy.

Enuresis in children is extremely common; very much allied to irritable bladder; but differing in this, that while, in the latter affection,

[1] Called to a case of incontinence in the adult, the existence of distended bladder should always be suspected, and examination made accordingly.

evacuation of the bladder is voluntary, in this case it is involuntary. During the day, the child makes water with unusual frequency perhaps; at night, the urine is passed involuntarily; and this unpleasant habit may continue in adolescence. Corporeal discipline may still be the favorite remedy among nurses, and with some parents, but it is as ill-judged as it is cruel and unnatural; the child might as well be punished for club-foot or the measles. The involuntary escape of urine is the result of a morbid state, and requires curative treatment. Usually, the general system will be found out of tone; and this is to be obviated by the ordinary remedies; more especially by cold bathing, and by small doses of the tincture of the muriate of iron. At certain stated hours, during the night, the child should be awakened for the purpose of emptying the bladder; and, if possible, he should be prevented from sleeping on his back, and from so exposing the most sensitive part of the bladder to contact with the urine. The bowels must be kept in good order, and the state of the rectum should be especially attended to. Ascarides may probably be found there; if so, they must be expelled. Certain means are supposed to have a special effect on the bladder. The nux vomica, or strychnia, is certainly of use; perhaps by allaying irritation, as well as by increasing tone at the neck of the viscus. The nitrate of potass has proved serviceable; and, in such cases, it is probable that the urine was scanty, acrid, and consequently unusually stimulant. In other cases, the more ordinary means having failed, benefit has accrued from cantharides internally; and in such cases, probably, there was a sluggish condition of the neck of the bladder and adjacent parts. The effect of this remedy has also been explained, by supposing that, acting as an irritant on the lining membrane of the urethra, especially at its posterior part, it produces turgescence there, so rendering the potential canal less easily opened up. Amendment has not unfrequently followed the application of a large blister over the sacrum; but whether by the principle of counter-irritation, or from sleeping on the back being thus effectually prevented, it is not easy to determine. Mechanical means, as the jugum penis, are not to be thought of.

It may happen that a boy, ashamed of his infirmity, and perhaps impelled by desire to escape corporeal punishment, voluntarily has recourse to mechanical aid; and, at bedtime, constricts the penis by a ligature, or a curtain-ring, or other suitable means which may occur to him. In the morning, he finds the parts swollen and painful; he is unable to remove the jugum; and, afraid of the consequences of a disclosure, he suffers in silence. The swelling increases; ulceration takes place; the foreign body becomes imbedded in the inflamed tissues; the penis may be gradually cut through; and, the urethra having been at length reached, a calculus begins to be constructed there. Such cases have been recorded by Liston, Helot, and others. Contrary to expectation, the erectile capabilities of the organ do not seem to have been impaired by the gradual transverse section.[1]

If called to such a case, after some days, with the constricting agent

[1] Lately, in operating on a little boy, on account of chronic paraphymosis, with preternatural opening of the urethra behind the glans, I found a tight piece of packthread deeply imbedded in the penis, and constituting the true stricture.

sunk in the inflamed parts, a free incision is to be made upon the offending body; which, having been exposed, is to be divided—by knife or pliers, according to its nature—and removed. If called early, a tight ring may be taken off, as from the finger, thus: pass the end of a stout and long thread beneath it, leaving the pubal end loose and prehensible; roll the rest of the thread tightly and closely round the penis, in front of the constricted part, so as to invest it wholly; then gradually unroll, from the pubal end; and the ring is shuffled forwards, as the thread is made to uncoil.

Retention of Urine.

This serious calamity may arise from a variety of causes; and treatment varies accordingly. The symptoms are: inability to evacuate any urine, while desire to do so is great, constant, and frequently aggravated—with straining, pain, and much distress. The bladder, rising in the pelvis, is felt above the pubes, and also by the finger introduced into the rectum; pressure above the pubes causes great pain, and percussion is dull there; in extreme cases the bladder may become an abdominal tumor almost as large and distinct as the gravid uterus—oval, tense, and fluctuating. If the bladder have been previously contracted in cavity and thickened in its coats, the ordinary symptoms of retention may be occasioned by the incarceration of but a small quantity of fluid; and then the tumor can be felt only by the rectum or vagina. In other cases, the bladder distends readily; and the tumor may be both large and high in the abdomen, before unpleasant feelings are complained of. As the case proceeds, pain and straining, with sickness, become more and more unbearable; the pulse rises, the skin grows hot, the tongue is dry; breath and perspiration may evince an urinous odor;—"urinous fever" is established; absorption of the vesical contents has begun. By and by the ureters become distended, as well as the bladder; increasing pressure is thus made upon the kidneys; their secretion is arrested in consequence; and suppression of urine, supervening on and caused by the retention, tends to produce coma and death.

If the bladder be relieved, the urgent symptoms disappear speedily; the patient passes from torment to Elysium; and under no circumstances will he be found more eloquently and sincerely grateful. He must be seen again soon, however, otherwise the unpleasant symptoms may be speedily restored. The kidneys, compressed by the enlarged and full ureters, had for some time been secreting little; on removal of that pressure, the secretion is renewed copiously, and the bladder may be soon refilled.

If no relief be afforded, a serious local accident is likely to occur, before the system has become fatally prostrate. The bladder or the urethra gives way; either by ulceration, or by actual tearing under strong action of the detrusor; and extravasation of urine takes place—of urine, be it observed, deprived of much of its aqueous part, intensely saline and acrid. The inevitable result is sloughing of the infiltrated parts; too generally followed by rapid sinking of the patient. Obvi-

ously, therefore, it is of the utmost importance to afford early and effectual aid in this affection.

1. *Retention from Stricture of the Urethra.*—In this case, perhaps the most common, danger is especially great; the thickened and powerful middle coat of the bladder laboring hard to overcome the obstacle to evacuation, and consequently rendering solution of continuity all the more imminent.

The patient has long been in the habit of making water tardily and ill; at last, the passage seems effectually closed; and the ordinary distress of retention supervenes. Probably an exciting cause may be found; indiscretion at the dinner-table, injudicious use of a bougie or catheter, exposure to cold or wet, or an attack of piles. The previously narrowed canal has become occluded by congestion, or by the swelling attendant on an active inflammatory process, in the affected part; and, no doubt, there is also spasm.

If the history of the case and its symptoms be such as to lead us to suppose that the strictured urethra is inflaming or inflamed, the catheter must be withheld; unless, indeed, the case be far advanced, and the safety of the parts from extravasation already endangered. Leeches are applied to the perineum in clusters, or cupping is had recourse to; the patient is seated in a warm hip-bath—and this bath need not be delayed till leeching is over, as the animals will not be disturbed by comfortable immersion. A full opiate is given, by the mouth or by the anus; or in both ways. Very probably, such relaxation occurs as to obviate all necessity for the catheter; urine dribbling away in the bath, and then perhaps coming in a tiny stream, sufficient to relieve all urgency of symptoms. In the event of failure, however, after a reasonable time and trial, the bladder must be relieved at all hazards.

In those cases where we have no reason to suspect inflammatory action, the catheter is used at once; of small size, steadily yet gently persevered with; the patient under chloroform. Sometimes the silver instrument refuses to pass, while a gum-elastic one, straight, and deprived of its stylet, enters the bladder with comparative ease. Sometimes it happens, that after the end of a silver catheter has been pressed steadily for some time on the stricture, and withdrawn, the urine begins to follow. In no case is force or violence to be employed. But when unsuccessful with the catheter and the auxiliary means already noticed, the bladder must be relieved at all hazards—through the perineum, or by the rectum, as will afterwards be stated.

2. *Retention from Urethritis.*—The inflammatory process may attack the urethra, independently of previous stricture; causing turgescence and occlusion. This may be the result of gonorrhœa, or of direct injury. Retention supervenes gradually; and there is time for antiphlogistic treatment. To this we trust; leeches, fomentation, hip-bath, antimony, &c.; withholding the catheter, if possible; inasmuch as its use, even though successful in relieving the bladder, must aggravate the inflammatory action, and tend to repetition in a worse form.

3. *Retention from Irritation and Spasm at the Neck of the Bladder.*—This may take place, irrespective of inflammatory action, or of organic change. In the dissipated, it is no uncommon result of a late

carousal, calls to evacuate the bladder, it is probable, having been imprudently neglected. A hip-bath, with an anodyne—opium or hyoscyamus, by the rectum or by the mouth—will usually give relief. If not, a full-sized catheter is to be passed, gently.

4. *Retention from Priapism.*—Priapism is a common result of spinal fracture; and sometimes it occurs in connection with venereal excess. In the former case, when retention takes place, we cannot expect benefit from direct treatment of the cause; and we must use the catheter. In the latter, by opium and camphor, and antimony; by the warm bath; by an opiate enema or suppository; and by leeches to the part, if need be, we may overcome the erection, and avert the use of instruments.

5. *Retention from Abscess in the Perineum.*—Abscess forming here—in connection with stricture, or as a result of direct injury—may bulge internally, so as temporarily to occlude the urethra. Catheterism would be very painful, and not unlikely to cause rupture of the abscess into the urethra, whereby urinous extravasation might occur. The knife supersedes the catheter; the abscess is opened from without; instant relief follows; retention is overcome, and the morbid state which caused it is at the same time removed.

Similar treatment may be required, on account of an abscess forming in the body of the penis, as a remote result of venereal disease.

6. *Retention from Pelvic Abscess.*—Pelvic abscess (p. 373), bulging on the neck of the bladder, may cause retention of urine.[1] Treatment is conducted on the same principles as in the case of perineal abscess; withholding the catheter, or using it very warily; and puncturing the abscess so as to at once remove both retention and its cause.

Retention may be simulated. The abscess may so compress the bladder as to prevent its distension; and consequently urine is almost constantly passing away in small quantity, from a collapsed viscus; while the abscess, forming a large, dull, hypogastric swelling, may be mistaken for the bladder largely distended. In one such case I thrust the catheter through the walls of the abscess, which was consequently evacuated through the urethra. The patient made a good recovery.

7. *Retention from Urethral Calculus.*—This occurrence has been already alluded to (p. 483); impaction of a calculus taking place in such a way as quite to occlude the canal. Three courses of procedure are open to us: We may by the catheter push back the calculus into the bladder, treating it afterwards by lithotripsy. Or we may at once remove it by direct incision. Or we may bring it to the orifice of the urethra, and thence extract it—by dilatation if necessary. If the stone is small, movable, and situate anteriorly, we prefer the last mode; if it is impacted in the prostatic portion of the canal, we probably prefer the first; if it is of some considerable size, firmly impacted, and beyond the prostatic portion, we have recourse to excision.

8. *Retention from Injury of the Perineum.*—1. Extensive bruise of the perineum may cause retention, irrespective of any injury done to the urethra; the extravasated blood bulging inwards on the canal. In

[1] A case is narrated in the *Lancet*, No. 1431, p. 118.

such a case, the catheter must be used, until by absorption the compressing agent has been diminished or taken away. 2. Again, injury of the perineum may induce inflammatory action, either in the urethra itself, or in the parts exterior to it; and, in the latter situation, abscess may form. The treatment advisable under such circumstances has already been stated (p. 497). 3. When the urethra has been torn or cut, there is no room for delay; retention must not be waited for; the catheter cannot be too soon introduced. For, if the patient have made an effort to evacuate the bladder, before such introduction, urine will certainly have escaped at the injured part, causing all the deadly results of extravasation. And only by early introduction of the catheter—retaining it until consolidation shall have taken place at the injured part—can extravasation be avoided.[1] If the urethra have been completely torn across, there may be difficulty in passing the instrument; nay, not improbably, the surgeon may be altogether foiled in his attempt to penetrate the vesical orifice—shrunk, retracted, and displaced. Under such circumstances, a free perineal incision must be made so as to expose the part; and then the catheter is passed through and retained. It is surely much better to make a limited incision, with the view of preventing extravasation, than to be compelled to incise largely afterwards, for the escape of sanies and sloughs, after urinary infiltration has occurred.

9. *Retention from Paralysis.*—A paralytic state of the detrusor may be the result of accidental over-distension merely; of spinal injury; of general debility, as in fever; or of senile decay. The ordinary call to evacuate the bladder having again and again been neglected, under circumstances of restraint, the sufferer, when liberated from these, will probably find no urine coming in obedience to his utmost efforts at expulsion. The muscular fibre of the detrusor has been over-stretched, and, for the time, is paralyzed. The catheter cannot be used too soon: and its introduction is to be repeated from time to time, never allowing any considerable quantity of urine to collect; so that the normal dimensions of the bladder, and the wonted functions of its muscular coat, may be speedily restored. Should the return of contractility be slow and imperfect, strychnia or nux vomica may be given, or electricity may be employed.[2]

In the case of spinal injury, the circumstances are very distressful; for, in addition to retention being ever liable to occur, there is phosphatic degeneration of the urine, with more or less change in the lining membrane of the bladder (p. 335). The prominent symptoms of retention, however, are probably less urgent than in other cases; there being usually diminished sensation in the viscus, as well as impaired muscular power. Occasional relief, too, may come, by partial escape of urine; for, the abdominal parietes may act on the bladder when greatly dis-

[1] It is a good general rule, in all cases of serious injury done to the perineum, to pass the catheter very cautiously, immediately on being called to the patient. If urine come away clear, it is a good omen, and a point is gained both in diagnosis and treatment.

[2] Probably the most effectual way of applying this agent is to introduce a silver catheter into the bladder, and a female catheter into the rectum, with its point resting on the recto-vesical parietes; and to connect each of these catheters with one of the poles of the electric machine. (*Monthly Journal*, Aug. 1850, p. 174.)

tended and risen; taking on themselves, in some measure, the lost function of the detrusor. Also, as the bladder changes in its coats, the middle coat, becoming hypertrophied, may acquire an increase of power, so as to effect a partial evacuation; "the muscular coat, which is not excited to contraction so long as the mucous coat is in a healthy condition, acquires a degree of abnormal contractility." In such cases, treatment is mainly spinal. The catheter is used from time to time; the usual means are taken to correct the depraved state of the uro-poietic system; and, during convalescence, recovery of power in the muscular coat may perhaps be promoted.

In protracted fever, retention is not uncommon, often with incontinence. It is obviously of much importance to detect this condition, and by catheterism to prevent it; otherwise a most injurious influence will be exerted on the already oppressed system, by absorption of the confined urine within the bladder.

In the aged, the detrusor, as other muscles, grows feeble; and, by reason of this, retention may occur. Relief is got by the catheter; and something may be done in amending muscular energy—at least for a time.

10. *Retention from Diseased Prostate;* it may be, from either an acute or a chronic enlargement of the gland. In gonorrhœa, the prostate is liable to the occurrence of acute swelling, with or without the formation of matter; and this may be to such an extent as to shut up the posterior part of the urethra. Treatment is by antiphlogistics; withholding the catheter, if possible. If abscess have formed, it must be evacuated externally, by incision; as in the case of similar affection of the perineum (p. 497). In chronic enlargement of the prostate, peculiar to advanced years, relief can be had only by the catheter. And an instrument must be employed of large curve, and at least two inches longer than that in ordinary use; for, by the prostatic enlargement, as well as by elevation of the bladder when distended, very considerable elongation of the urethra takes place, and an ordinary instrument must necessarily fail to reach the bladder—as will afterwards be more fully explained.

It is in this form of retention that incontinence of urine is so apt to show itself as a symptom. For years, perhaps, the bladder has been imperfectly evacuated; a certain amount of residuary water has always lodged in that viscus; and the amount increases; at last the bladder becomes completely distended, and the urine which comes fresh from the ureters—as surface water—dribbles over, and is involuntarily discharged.

Very frequently, the kidneys become diseased. In such a case, the catheter must be used cautiously. Were it to be passed at regular periods daily, fully evacuating the bladder on each occasion, it is probable that the kidney, thus deprived repeatedly, suddenly, and completely of the circumstances which had so long tended to restrain their secretion, would become untowardly excited, and fatal aggravation of the renal disease might ensue.

11. *Retention from Blood in the Bladder.*—If this occur in connection with spontaneous disruption of a vesical calculus, lithotomy is probably the best remedy, as already stated (pp. 458 and 491). In other

circumstances, we have recourse to a full-sized catheter, with large eyelets; and aid its action, if need be, by an exhausting syringe. The ordinary hemostatic means are at the same time had recourse to, to prevent continuance of internal hemorrhage.

12. *Retention from Malignant Disease of the Penis.*—As carcinoma or cancer advances in destruction of the penis, secondary glandular enlargements occur, both without and within the pelvis; and, in consequence, the outlet of the bladder may come to be completely obstructed. In such retention, we can only hope to palliate, and briefly to extend the now closely meted term of existence. The bladder is relieved by puncture above the pubes, and the aperture is kept pervious.

13. *Retention from Imperforate Urethra.*—This is a state of matters analogous to retention of the meconium by an imperforate condition of the anus (p. 430). The perforation necessary to complete the canal cannot be too soon accomplished.

Retention of Urine in the Female.

The most ordinary causes of this affection are—pregnancy, tumors, paralysis, and hysteria. The gravid uterus is likely to compress the urethra; more especially about the fourth month, when the tumor is considerable, and not yet risen out of the pelvis. Relief is by the flat catheter. Other tumors may compress and obstruct the urethra; uterine, ovarian, vaginal. Here, again, as well as in the case of paralysis—of frequent occurrence after delivery—the catheter is employed. But, in hysteria, this instrument ought generally to be refrained from. Hysterical women very often labor under retention of urine, simply because they refuse the effort of volition necessary for expulsion of the bladder's contents. Use the catheter, and repetition of the retention speedily occurs, the cause remaining the same. But refuse the catheter, and allow distension to proceed, until the stimulus thereby occasioned becomes such as to compel the detrusor to its function; and then, by an effect partly moral and partly physical, the patient will find herself permanently relieved. There are obstinate cases, however, which resist this mode of cure; and, in them, care must be taken not to endanger the bladder, by an excessive withholding of the instrument.

Puncture of the Bladder.

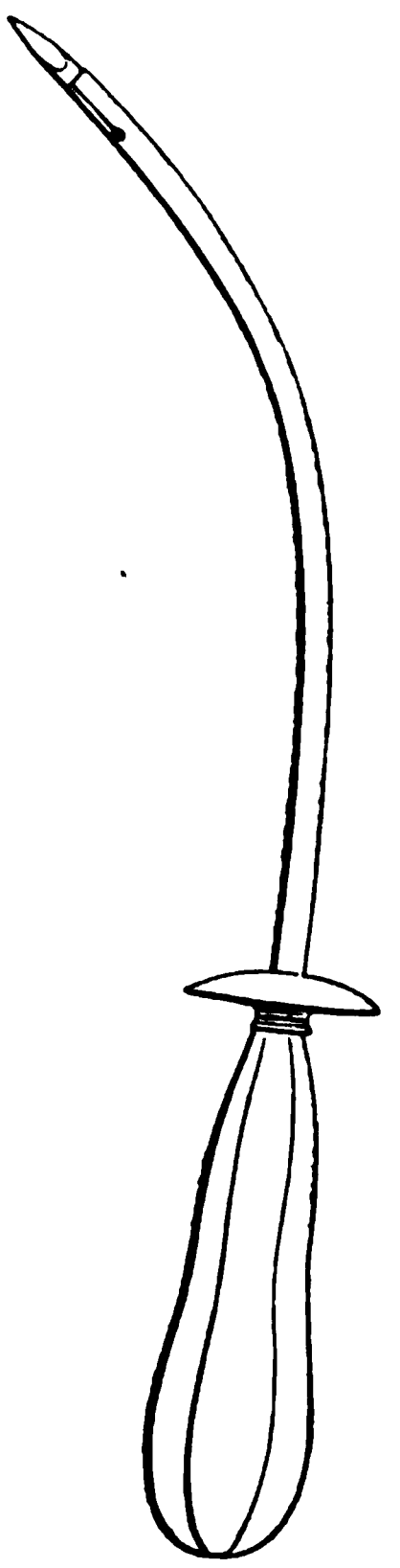
This operation becomes necessary, when urgent retention of urine exists, and when by the catheter we have failed to afford relief. It may be performed in a variety of ways; by the perineum, by the rectum, or above the pubes. 1. *By the Perineum.*—This is preferable in all cases of obstinate retention caused by impassable stricture, or other obstruction of the urethra; the bladder is safely relieved, and the cause is at the same time effectually dealt with. The patient is placed in the position of lithotomy; a catheter of medium size is passed down to the constricted part, and its point is cut upon by direct incision, in the central raphé; behind the end of the instrument, we expect to find a bulging dilatation of the urethra on the vesical aspect of the stricture: this is

pierced by the knife; and urine rushes out, affording complete relief to the bladder. Then the knife is carried forwards, so as to divide the constricted part of the urethra, as accurately and thoroughly as possible. That having been laid open, the catheter is passed on and retained; and thus a most effectual beginning is made towards permanent removal of the stricture. The operation is avowedly difficult—the dilated portion behind being not always easily found, and it requiring great care to make sure that the incisions at the constricted part lay open the canal of the urethra; but when rightly performed, it is thoroughly sound in both its principle and results. It is rarely, however, that any such procedure is demanded of the experienced surgeon; generally, he succeeds by the catheter and its auxiliaries—chloroform seldom omitted.

But this may be said to be puncture of the urethra, rather than puncture of the bladder; and so it is. In strict accuracy, perineal puncture of the bladder may be held to denote the reaching of the neck of that viscus, by the thrust of a trocar and canula, or by means of a small lithotomy wound—an operation which is very seldom performed for mere retention.

2. *By the Rectum.*—This is a simple and safe operation; but is apt to leave a troublesome, fistulous communication between the bladder and bowel. We have recourse to it, when foiled in the use of the catheter, and when the method by perineal incision is not considered advisable—or when that has failed; and, indeed, it may be performed in any case, by a surgeon who prefers it, except when the prostate is much enlarged. The patient is placed recumbent, with the limbs raised. The fore and middle fingers of the surgeon's left hand are introduced, well oiled, into the rectum; and their points are rested on the central space immediately behind the prostate. A long curved trocar is introduced by the right hand, with its stylet withdrawn within the canula; the extremity of the latter is fixed on the *trigone*, between the points of the fingers resting there; and, the stylet being then pushed forward, both the trocar and its canula are lodged in the bladder. The trocar is withdrawn, and the canula is retained. If there be good prospect of speedily removing the cause of retention, the canula may be very soon taken out. Otherwise, it should be retained for some days, so as to prevent premature closure of the wound.

Fig. 220.



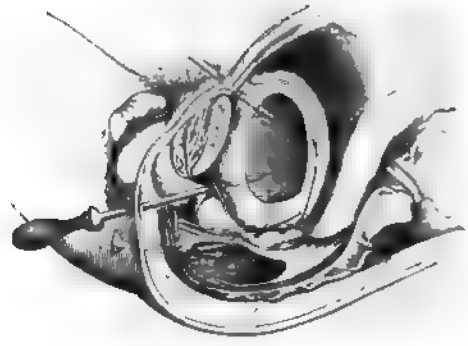
Trocar for puncture of the bladder by the rectum.

3. *Above the Pubes.*—This is our last resource, when both the other methods are deemed impracticable. The operation is similar to supra-pubal lithotomy (p. 481). A small incision is made through the parietes, immediately above the symphysis, and through this the bladder is punctured at its lowest part, by means of a short trocar and canula, similar

to what is used in ascites, directing the point of the instrument obliquely backwards, towards the promontory of the sacrum. The canula is left, or a portion of elastic catheter, or a short lithotomy tube. And the patient is laid on his side, so as to favor outward escape of the urine.

These methods of operation have been enumerated, according to what is conceived to be their merit. All are rare, in actual practice, and

[Fig. 221.]



[Plan of the different points at which Puncture of the Bladder may be performed. (From Fergusson.)—Ed.]

deservedly so, for none are of a favorable character. But any one of them is much preferable, at any time, to postponement of relief, and consequent disaster by extravasation; and all, too, are preferable to pushing a metallic catheter by sheer force through an impassably strictured urethra.

Extravasation of Urine.

This may be either vesical or urethral. The *Vesical*, as we have already seen, may follow wound, ulceration, or tearing of the viscus. 1. After the wound of lithotomy, it is too common; 2. Cystitis may lead to perforating ulcer; 3. Retention of urine may be relieved only by a bursting of the bladder, or by a more gradual giving way by ulceration. Actual laceration, however, is not uncommon, and it is not difficult to understand why. Cohesion of the parts has been previously diminished, by the inflammatory process occurring in them, and, themselves unusually lacerable, they are powerfully acted on not only by a hypertrophied detrusor, but also by the muscles of the abdominal parietes and the diaphragm. 4. The bladder may be lacerated by external injury, as by blows, or falls on hard substances, more especially when the viscus happens to be distended (p. 504). The nature and treatment of the first form has already been considered (p. 478). The second is hopeless; the patient will necessarily perish, by peritonitis, or by areolar infiltration and sloughing, according to the site of the urinous escape. In the third form, that occurring by unrelieved retention, there is but little hope, yet there is some room for treatment. During violent effort to overcome the obstacle to expulsion of urine, something is felt to yield, and relief is experienced and expressed, yet.

probably to the patient's surprise, no urine is seen to come by the penis. By and by, the sense of relief and comfort passes off, burning heat is felt in the infiltrated part, and the constitutional symptoms attendant on asthenic inflammation and gangrene, which must follow, declare themselves in their most formidable shape, rapidly becoming more and more typhoid, and soon ending in fatal collapse. Or, if the viscus have fortunately given way at its most anterior part, the local mischief may advance outwardly, and perhaps evacuation by the perineum may occur, with more or less relief. Treatment obviously consists in reaching the infiltrated part, if possible, by early, free, and dependent incision, and in maintaining the powers of the system, under the strong depressing agent so busily at work, by every means in our power. No case, in which an outward and efficient opening has been afforded, is to be considered too desperate. Nourishment and stimuli must be steadily administered. Unexpected and wonderful recoveries have rewarded perseverance.

Urethral Extravasation is more common, as a consequence of stricture. The urethra gives way, by ulceration, at some part of its course, and the bladder remains entire. There may not be the same sensation of something having yielded during straining, but there is, generally, the same temporary feeling of relief having been obtained. Soon, however, there is a painful undeceiving; the infiltrated parts become hot, swollen, red, black, dead; a urinous odor seems to exhale from the whole body, but more especially from the parts affected, and the ordinary typhoid irritation of system becomes more and more developed, low and rapid pulse, black tongue and mouth, sunk and anxious features, cold clammy skin, hiccough, muttering, delirium.

The site and amount of local mischief depend on the part of the urethra which has given way. Not unfrequently, it is behind the bulb, and the urine, restrained, at least for a time, by the deep fascia, burrows deeply. In such a case, the local signs may be obscure, the scrotum being uninvolved, and the perineal swelling and discoloration at first indistinct. Should the glans penis be found swollen, hard, and blackening, it is a sign of the corpus spongiosum being infiltrated and an omen of most sinister import. In such cases, an early and free incision, in the centre of the perineum, affords the only chance of relief and safety, the knife being pushed determinedly down, so as not merely to expose the surface of the infiltrated parts, but also to lay bare the source of extravasation.

When the giving way has occurred at a point anterior to the deep fascia, the case is more plain and less hazardous. The scrotum, and the integument of the penis, sometimes the inside of the thighs, and the lower part of the abdominal parietes, not always the perineum, become rapidly swollen, and of a dark red hue; then the integument blackens, crepitates, and sloughs, and, as the sloughs separate, urine and fetid sanies flow away. Long before this open state, however, the olfactory organs alone are sufficient for diagnosis. In this case, the incisions do not require to extend so deeply, but are more numerous and extensive, leaving no part of the infiltrated textures without a free

outward opening. Poultice and fomentation follow the knife, usually with active support of the system. In a day or two the poultice is superseded by water-dressing, and this again is medicated by the chlorides. Immediate hazard having been got over, and the parts having passed from excitement, means are taken to overcome the cause of the accident, and to restore the urethra to its normal condition. In the great majority of cases, a tight stricture is found anterior to the site of ulceration.

But urinous irruption does not always take place directly from the urethra; urinous abscess may have formed, as the first result of the stricture; and then, the parietes of this abscess having yielded, extravasation takes place outwardly. The consequences and treatment are the same as in the direct and ordinary variety.

Injuries of the Bladder.

This viscus may suffer in various ways, by the hand of the surgeon. In lithotomy, it may be unnecessarily cut, or bruised and torn by the forceps or scoop. In lithotripsy, it may be pinched, bruised, or torn, by a rash and inexperienced operator. By the catheter, too, it may sustain hurt. The risks are hemorrhage and inflammatory action; to be obviated by the means already considered.

Not unfrequently, the bladder suffers by accident. The pelvis is broken; and a spiculum of bone, projecting inwards, is liable to penetrate the viscus, more especially if it happen to be distended with urine. Urinary infiltration can scarcely fail to occur; and probably to such an extent as to prove rapidly fatal. Or laceration may take place, in consequence of a blow or bruise; and it is well to remember that this result may follow an application of violence apparently by no means great, if the bladder happen to be at the time full of urine. Blows, kicks, falls have often proved thus fatal; and in the female it has occurred, from merely the superincumbent weight of another person. Ordinarily, however, the force applied is considerable. And unfortunately, the portion of the viscus which is most apt to give way, is where it is covered by peritoneum, near its fundus; the outer coat, less extensile than the rest, is most apt to tear; and, besides, the force is likely to jam this part of the bladder on the promontory of the sacrum. There is great pain in the region; only a small quantity of urine comes by the urethra, and that is more or less mixed with blood; no tumor of distended bladder can be felt by the rectum or vagina; the catheter draws off but little fluid, and that is bloody; by and by the ordinary signs of urinary infiltration are declared.

If the tear has been extra-peritoneal, on the anterior aspect of the bladder, there is hope in the treatment. The urine may, in its infiltration, approach the surface in a somewhat limited way; timeous and free incision of the abdominal parietes may evacuate it, with sloughed areolar tissue; and the patient may be saved—even with complete return of the urine to its natural channel.[1]

[1] Syme, Contributions to Surgery, p. 332.

When the injury affects that part of the bladder invested by peritoneum, the urine passes at once into the peritoneal cavity; and escape from death is hardly to be looked for. Still, there is room for treatment. The catheter is introduced; no water will probably come, unless there has been penetration through the aperture in the bladder; but the instrument should be retained, with its point just within the neck of the bladder, so as to afford an outlet to what may be afterwards secreted. Should the patient survive for a day or two, it is possible, as dissection has shown, that by inflammatory agglutination of the abdominal contents, the general cavity of the abdominal peritoneum may be shut off from that of the pelvis; the latter becoming coated with lymph, like an abscess, and the urine confined there. Under such circumstances, it has been proposed to tap this cavity from the rectum, by means of the long and curved trocar (p. 501).[1]

In the parturient female the distended bladder is apt to suffer. By instruments in extraction of the fœtus, it may be torn; by long-continued pressure of the head of an impacted fœtus, it may be induced to slough or ulcerate; and vesico-vaginal fistula is the result—provided the patient recover.

Tumors of the Bladder.

Fortunately this is a rare affection. The interior of the viscus, however, is occasionally the seat of tumors; and these are of two kinds.

[Fig. 222.]

[Polypous Growths from the mucous membrane of the Bladder. (From Gross. Copied from Civiale.)—Ed.]

Simple mucous polypi may form there, in considerable numbers; simulating the ordinary symptoms of stone. The sound finds no calculus,

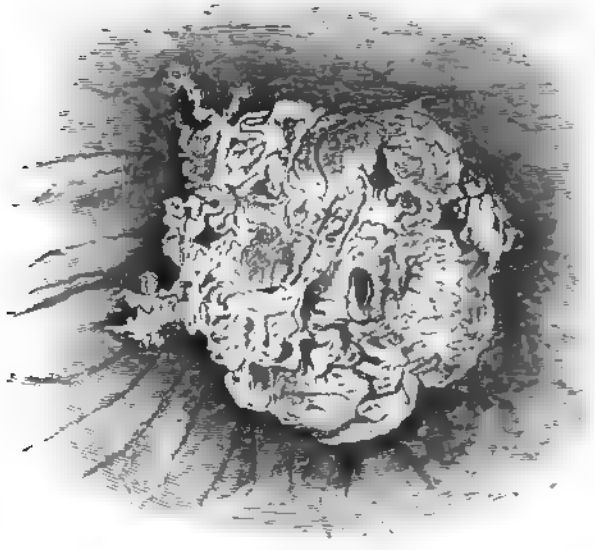
[1] Lancet, No. 1386, p. 352.

but may be felt impinging on a soft and movable substance, obviously extraneous to the bladder's coat. It has been proposed to deal with this by means of the lithontriptor; but the prospect of success does not seem very inviting.

Malignant tumors may form; medullary; growing from the coats of the viscus—usually near its neck, in apparent connection with the prostate—and occupying the cavity to a greater or less extent. Micturition is frequent and painful; and the pain is greatest immediately after the effort; the urine is bloody and fetid, and often contains flaky substances, or masses of the disorganized tumor; by impaction of these, occasional retention may occur; dull weight is felt in the loins; and the pain of micturition is much more pelvic, and more extensive there, than in the case of stone; also the sound, on encountering the foreign body, imparts quite a different sensation. There is no remedy for this disease. We can only hope to palliate, by opiates, and the recumbent posture. Sometimes the tumor, expanding, may cause retention which is not capable of being relieved by the catheter; and, in such circumstances, we are called upon to protract existence, by puncturing the bladder above the pubes.

Cancerous disease may extend from the rectum to the bladder, involv-

[Fig. 228.]



[Drawing of a vascular, soft, spongy Tumor of the Fundus of the Bladder. (From Gross.)—Ed.]

ing all in one large and loathsome sore. Malignant tumors also form between the two viscera, as formerly stated (p. 427). There is for such cases no cure.

Displacement of the Bladder.

It has been already stated that sometimes, though rarely, the bladder is protruded, so as to constitute the contents of a hernial tumor. And displacements, too, of this organ, by pelvic abscess and tumors, are alluded to elsewhere.

Miserable cases are not very unfrequent, in which the anterior half of the bladder is congenitally defective, as well as the corresponding part of the abdominal walls; the mucous surface of the viscus becoming consequently protruded to constitute a red moist swelling, from which the ureters may be seen throwing out their fluid.[1] These admit of mere

[Fig. 224.]

[Case of congenital *Extrophy* of the Bladder—the anterior wall of the abdomen, and that also of the bladder being deficient. The patient was 19 years old when the drawing was taken. *a*, represents the bladder, its mucous membrane everted and protruded through the abnormal opening in the anterior wall of the abdomen, constituting a red, moist, soft, easily-bleeding, painful tumor. *bb*. Orifices of the ureters. *c*. Penis without urethra. *dd*. Symphysis pubis. *e*. Scrotum and testis. *f*. Congenital inguinal hernia. (Gross, *Diseases and Injuries of the Bladder*, &c. p. 96.)—Ed.]

palliation, by wearing mechanical contrivances adapted for protection and comfort. If the patient live to old age, the mucous coat is apt to become covered with vegetations, which, assuming malignancy, may fungate and bleed, and prove fatal.

It has also happened, in the female, that the bladder has been inverted and protruded through the urethra, forming a vascular-looking tumor between the labia.[2] Were this removed, under careless diagnosis, by

[1] Handyside, Edin. Medical and Surgical Journal.

[2] Crosse, Trans. of Provincial Med. and Surg. Assoc. vol. ii. 1846; and Brit. and For. Rev. Oct. 1846, p. 319.

knife or ligature, the most serious consequences must ensue. The true nature of the case may be ascertained by discovering the orifices of the ureters, and finding the whole tumor to be reducible within the pelvis. Sometimes it is irreducible.

Laroche, Dissertation sur l'Hématurie, Paris, 1814. Chopart, Traité des Maladies des Voies Urinaires, Paris, 1821. C. Bell on Diseases of the Urethra, Bladder, &c. Lond. 1822. Howship on Diseases of the Urine and the Urinary Organs, Lond. 1823. Foot on Diseases of the Urethra and Bladder, Lond. 1826. Bégin and Lallemand, Dict. de Méd. Prat. (art. *Hématurie*) t. ix. Paris, 1833. Coulson on Diseases of the Bladder and Prostate Gland, Lond. 1842. Guthrie on the Anatomy and Diseases of the Urinary Organs, Lond. 1843. Brodie, Lectures on Diseases of the Urinary Organs, Lond. 1849. [Civiale, Traité pratique sur les Maladies des Organes Génito-Urinaires, Paris, 1851; Gross, Diseases and Injuries of the Bladder, &c. Philada. 1851.—Ed.]

CHAPTER XXXII.

AFFECTIONS OF THE PROSTATE.

Prostatitis.

The prostate is liable to be affected by an acute inflammatory process, during the progress of virulent gonorrhœa. And this may also be excited by direct injury of the part—as by a blow on the perineum, or rash usage of instruments introduced by the urethra; by excessive venereal indulgence; by imprudent exposure to cold and wet; by sympathetic influence from affections of the rectum; by the internal use of cantharides, or other irritants. Heat and pain are complained of in the perineum, near the anus, and there is tenderness on pressure there; water is made frequently, and with pain; and pain is greatest as the accelerator muscles exert themselves to expel the last drops; there is a sensation of weight in the rectum; and that bowel is evacuated with both difficulty and pain; the finger introduced into the rectum ascertains the prostate to be large, hot, and tender on pressure; and an attempt to pass a catheter into the bladder is difficult and painful—the difficulty and pain occurring when the instrument's point has reached the prostatic region. Not improbably, the action extends to the bladder, and then the ordinary symptoms of cystitis are added to those already described. Treatment is by rigid confinement to the recumbent posture, leeching of the perineum, hip-bath, fomentation, and opiate enemata or suppositories. Sometimes relief is obtained from large, warm, and emollient enemata, which may be supposed to act as a poultice applied directly to the part. Direct leeching has been proposed, by means of a tube, or speculum, introduced by the rectum; but it is probable that the irritation attendant on the application, will more than counterbalance the benefit obtained by such abstraction of blood.

Abscess of the Prostate.

When the above symptoms sustain sudden aggravation, with rigor, increase of swelling and tenderness in the perineum, greater difficulty of micturition, and greater swelling and tenderness on examination by the rectum, it may be presumed that matter is forming in the gland. Careful examination is made, in order to arrive at correct diagnosis; and as soon as fluctuation can be discovered, however obscurely, a direct incision is made by the perineum, to procure outward evacuation. If

an artificial opening be delayed, the abscess may open into the urethra—favoring the formation of urinous abscess; or into the rectum establishing a troublesome recto-vesical fistula; or outwardly by the perineum, after much injury has been done to the intervening tissues. Spontaneous evacuation into the urethra is indicated by copious purulent discharge from the penis. And then it is advisable to use a catheter, gently introduced, as often as may be necessary to empty the bladder—for some days—so as to prevent, if possible, untoward entrance of urine by the ulcerated aperture; or a soft elastic catheter may be passed and retained.

Chronic suppuration of the prostate has been observed, causing much distress, with discharge of muco-purulent urine. On examination by the rectum, a soft point has been felt in the gland; and, on pressing it, matter has escaped by the urethra. The plunge of a lancet or trocar into the soft point has given relief, and troublesome fistula has not followed.

Simple Enlargement of the Prostate.

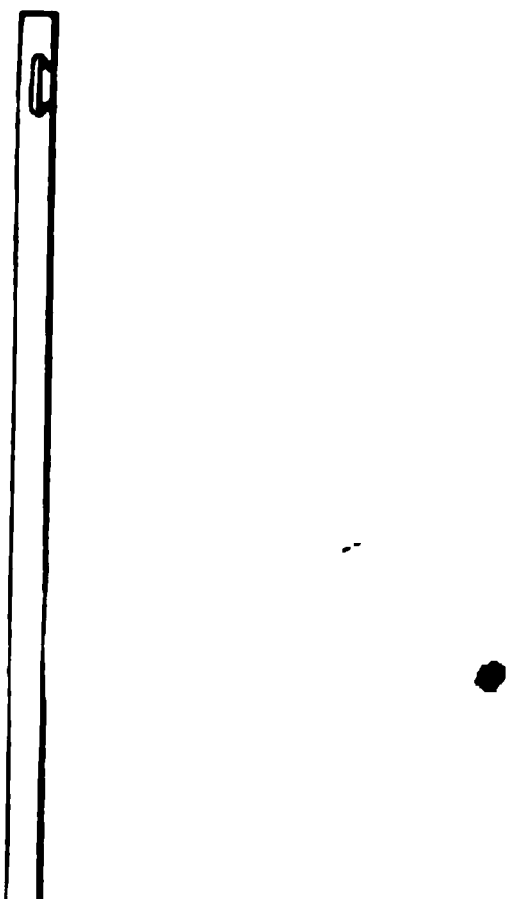
Simple enlargement of the prostate is of two kinds; one the result of chronic prostatitis; the other hypertrophy, independent of the inflammatory process; the one not uncommon in the adult of middle age, the other peculiar to advanced years. The former variety is dependent on stricture, or gleet, or affection of the rectum, or injury of the perineum by habitual horse-exercise; and disappears, usually, on removal of its cause. If not, recumbency is to be maintained, a few leeches are applied to the perineum; these are followed by smart counter-irritation, and, at the same time, internal use of the iodide of potassium may be of great service. The bowels are kept gently open, by simple laxatives and enemata. In obstinate cases, an alterative course of mercury is expedient; and, under this, amendment is sometimes both rapid and satisfactory.

Hypertrophy of the gland is usually regarded as but one of the many signs of senile degeneracy in the frame. As the eyes grow dim, the trunk bends, the cartilages ossify, and the arteries change in their coats, so the prostate is supposed to grow large and hard. The enlargement may be uniform, the whole gland seeming to expand equally; displacing the urethra as well as compressing it, and consequently interfering with its function in regard to the urine. Or the central portion may enlarge with much greater rapidity than the rest of the gland; rising like a mamillary process; projecting backwards into the bladder; but, ever and anon, liable to move forwards, and so to act as an occluding valve to the outlet of the cavity. In general, the lateral lobes enlarge unequally; and consequently a twist is given to the prostatic portion of the urethra, in the lateral as well as in the vertical direction.

The symptoms of this simple hypertrophy are—increasing slowness and difficulty in making water, uneasiness and difficulty in emptying the rectum, with a sensation of weight in that bowel and in the perineum; sometimes the feces are passed flattened, as in stricture of the

rectum. On introducing a catheter, some difficulty is likely to be met with in passing the region of the prostate; and when a finger in the rectum is made to press upwards on the catheter, the enlarged prostate is plainly felt between. Without the use of the catheter or bougie, tactile examination is never certain. As the tumor enlarges, calls to empty the bladder are more frequent, and the act is less perfectly accomplished; as formerly stated, a portion of residuary water remains, cooped up behind the enlargement (p. 499). The bladder sympathizes; it may become irritable; more frequently, a degree of chronic cystitis is excited. The urine changes in consequence; becoming dark-colored, fetid, and full of mucus. The vesical aspect of the projection may ulcerate, giving rise to hæmaturia, purulent urine, and aggravation of all the distress. The difficulty in micturition increases; and, at last, some casualty acting as an exciting cause, retention occurs. Generally, this has not existed long before the "surface-water" comes to dribble away; and, by the establishment of incontinence, the retention is partially relieved, as formerly stated (p. 493). It may happen, however, that the obstruction is complete; and by retention the patient may perish. Or, the whole urinary system having become involved in disease, death takes place by gradual exhaustion.

Fig. 225.



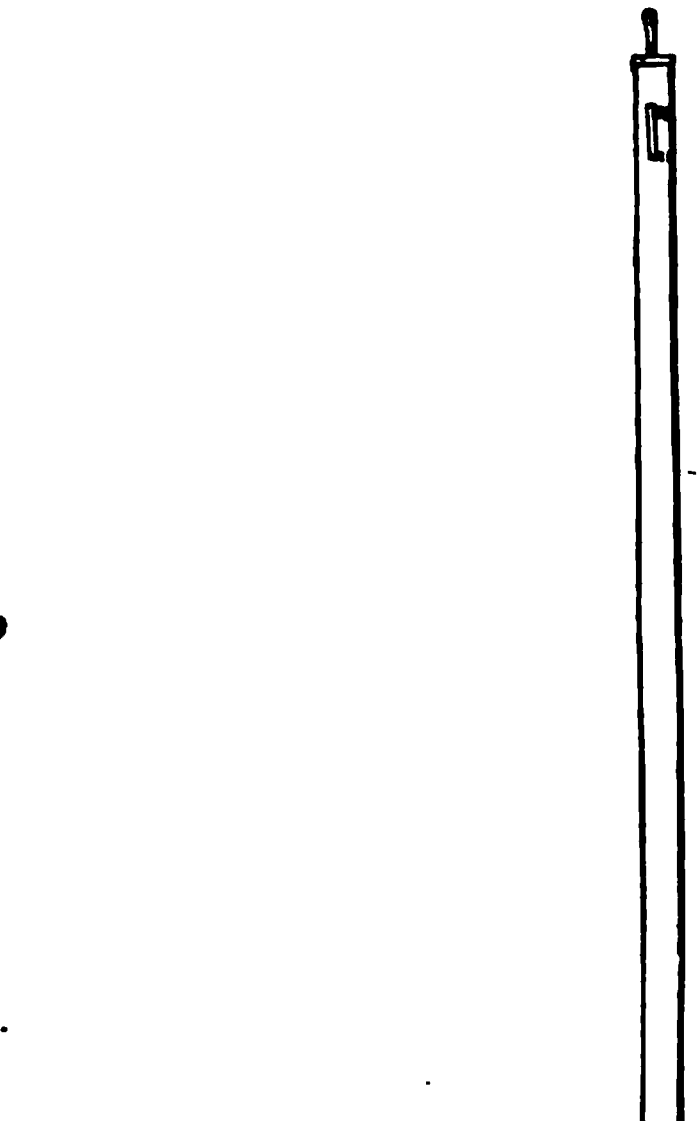
The ordinary Catheter, of half size.

Treatment is but palliative. We can scarcely hope to retard, much less to remove the enlargement. Every excess and imprudence is avoided in diet and exercise; and the recumbent posture is maintained as much as possible. The bowels are regulated by enemata and simple aperients. Opiates are given occasionally; and acids, iron, buchu, &c., are exhibited, as the complication by chronic cystitis may seem to demand (p. 489). To avert distension of the bladder, the catheter is used as often as may seem necessary. Excision of the gland has been talked of, but scarcely in sober earnest.

When retention has occurred, the catheter requires a peculiarity of management. As already stated, the urethra is considerably elongated; and the catheter must be of a proportional length. The prostatic portion of the urethra almost invariably has a bend given to it, antero-posteriorly—that is, the convexity is towards the rectum, the concavity towards the pubes; and, to suit this peculiarity of form, the instrument should have a large curve. Very frequently, the central enlargement

—or "third lobe," as it is usually called—exists; and, to surmount it, it is well to have at least one instrument in the prostatic set, whose point makes a sharper curve upon the general bend. It is introduced carefully; and, to assist the point onwards, the handle is freely depressed after passing the triangular ligament; while, at the same time, the point is elevated by means of the finger in the rectum. If the silver catheter, thus made and managed, refuse to enter, one of elastic gum may be tried; bent to the proper shape, and introduced with the stylet. On reaching the prostatic obstruction, the stylet is gently withdrawn, while the catheter is pushed steadily on, and the consequent elevation of the point may perhaps lead it over the obstruction. Or, the stylet being held steady, the tube is passed on, and the same effect is produced—the catheter's point curving round that of the stylet, as it were.

Fig. 226.



The Prostatic Catheter; of half size.

There is another peculiarity. As the prostate enlarges, not only is the prostatic portion of the urethra unusually extended and curved; it is also very considerably enlarged, by dilatation of the prostatic sinuses on each side of the verumontanum.[1] In retention, this dilatation is usually full of urine; in fact, may be considered as a small fictitious bladder in front of the real one. On the catheter reaching it, a spoonful or two of urine may be discharged, and the surgeon may in consequence be led to suppose, that he has reached the bladder and emptied it—the remaining swelling consisting of abscess: the plunge of a trocar may follow; or the patient may be left to his fate, unrelieved. But, by invariably using the long catheter, in such cases, and never resting satisfied unless this instrument be passed *tenus capulo*—unless, indeed, water flow freely. without such extreme insertion—the surgeon is safe from all such serious error.

[1] Deschamps, Traité de la Taille, tom. i. p. 200.

Perhaps the prostatic obstruction proves insurmountable. Then the bladder must be relieved at all hazards; and one or other of the following methods may be adopted: The catheter may be forced through the obstruction; guided in a good direction by the finger in the rectum. Or a trocar and canula may be used instead of the catheter. Or, the bladder may be punctured above the pubes. The operation by the rectum is obviously unsuitable.

Of these proceedings, perforation of the prostatic obstruction is the most advisable, by means of a suitable trocar and canula; the latter, of the same length and caliber as a full-sized prostatic catheter, but considerably less curved. It is passed carefully on to the obstruction, with its trocar withdrawn, and with its extremity temporarily occupied with a bulbous wire; and, when satisfied by the finger in the rectum, that the instrument is duly directed towards the bladder, the bulbous wire is removed, the trocar is inserted and protruded, and the whole is pushed on. The trocar is then wholly withdrawn; and the canula is retained for some days. When the retention has been of long duration, and there is reason to believe that the kidneys are organically diseased, the urine is to be withdrawn gradually, for the reasons formerly adduced (p. 499).

Malignant Disease of the Prostate.

The gland is sometimes, though rarely, the seat of scirrhus. More frequently, it is affected by medullary formation, which enlarges rapidly, ulcerates, bleeds, and follows the usual course of such tumors. The disease is not peculiar to the aged. It may occur in children, as medullary tumors in other sites so frequently do. The symptoms are similar to those of mere ordinary enlargement, with the addition of those of tumors in the bladder (p. 505), as well as of those which attend and characterize all malignant formations. The disease is incurable. By opiates, the catheter, enemata, and rest, we may hope to palliate and protract.

Deschamp, Traité sur la Taille, tom. i. Paris, 1796. Home, Everard, Practical Observations on the Diseases of the Prostate Gland, Lond. 1811. Lawrence, Lectures in the Lancet, 1829–30, vol. ii. Coulson, on Diseases of the Bladder and Prostate Gland, Lond. 1842. Brodie, on Diseases of the Urinary Organs, Lond. 1849. Adams, on the Anatomy and Diseases of the Prostate Gland, Lond. 1851. [Civiale, Traité des Maladies des Organes Genito-Urinaire, Paris, 1851. Gross, Diseases of the Bladder, Prostate Gland, and Urethra, Philad. 1851.—Ed.]

CHAPTER XXXIII.

THE VENEREAL DISEASE.

The history of the venereal disease is involved in some obscurity. However, it seems extremely probable—if not, indeed, quite certain—that affections of the genital organs, dependent on licentious venereal intercourse, have existed from the earliest ages; that they have prevailed in various degrees of frequency and intensity, at different times and places; that they were not directly imported from America to Europe, by Columbus's followers, in the end of the fifteenth century; but that, between the years 1493 and 1495—at the time of the siege of Naples—they experienced an aggravation in Europe, and consequently attracted much more prominently the attention of the profession.

They are usually spoken of under the general term of "The Venereal Disease;" and this again is divided into Gonorrhœa and Syphilis; both the result of the application of animal virus, engendered by illicit intercourse—or at least communicated thereby; the former an inflammatory affection of the urethra; the latter a contamination of the whole system, preceded by the formation of pustular ulceration on some part of the penis, or other part of the body. By some, it is still maintained that the poisons are the same; that what produces gonorrhœa, is capable of exciting syphilis, and *vice versa*. The weight of authority, however, preponderates largely in favor of an opposite opinion; admitting, perhaps, that gonorrhœal virus is capable of causing the simplest form, only, of venereal ulcer; and even that concession is by many not granted.

Gonorrhœa.

An acute inflammatory process seizes on the lining membrane of the anterior part of the urethra; caused by the application of gonorrhœal matter, from a second party; and this application usually made during sexual intercourse. There is a period of incubation, of uncertain extent; discharge may show itself within not many hours after connection; or it may not be till after many days have elapsed. About the fifth day may be taken as the average period of accession. Heat and itching are felt in the glans, which seems fuller and more deeply colored than usual; the urethral orifice is uneasy, red, and swollen; urine is passed in a small stream, sometimes forked, and with increasing heat and smarting: the orifice of the urethra shows an increased secretion; then it becomes dry, more red and swollen, and painful; the stream of urine is more

diminished, and the pain which accompanies it is intense; then discharge returns—no longer limpid, but turbid and puriform—becoming more and more profuse, and ultimately seeming to consist of true pus; and if the action prove intense, there may be a considerable admixture of blood. Sometimes smart fever affects the system; sometimes there is but little constitutional disturbance. The thighs, loins, and testicles sympathize by a dull aching sensation.

Such are the ordinary symptoms at the onset of the disease. But, in the course of its progress, serious additions may be made. 1. *Chordee may occur;* that is, abnormal erection may take place; the penis becoming bent like a bow—forming an arc of which the urethra is the chord—the convexity on the dorsal aspect—probably on account of exudation having taken place into the corpus spongiosum, so as to prevent uniform expansion of the erectile apparatus. Such erection is intensely painful, and tends to aggravate the disease; it is also liable to induce profuse hemorrhage, probably by laceration of the mucous membrane. The tendency to chordee is greatest during sleep; while the patient is warm in bed, and perhaps excited by voluptuous dreams. Sometimes, its proximate cause would seem to be other than plastic exudation; normal and abnormal erections alternating with each other. 2. *The glans may become excoriated*, furnishing a profuse discharge; establishing what is termed Spurious Gonorrhœa. 3. *The prepuce may become œdematous;* inducing the condition of Phymosis, when the swollen prepuce maintains its ordinary relation to the glans; causing Paraphymosis, when it is reflected behind the glans, and allowed to remain there. The former state aggravates the disease, by retaining discharge, and increasing the tendency to affection of the glans; the latter leads to strangulation of the glans, and consequently to intense exacerbation there. 4. *The lymphatics may suffer;* becoming painful, red, and swollen on the dorsum of the penis; or, without such indication, inflammatory enlargement may take place in the inguinal glands, constituting what is termed Sympathetic Bubo. 5. *Abscess may form in the penis;* on the dorsum; or beneath, opposite to the lacuna maxima. The latter is the more frequent site. A main residence of the inflammatory action—which, in the first instance, does not extend beyond two inches from the orifice—seems to be in this lacuna; which swells and becomes hard; filled with accumulated secretion internally, and externally invested by plastic exudation. In this exterior true inflammation may occur, causing abscess of greater or less extent. 6. *Or abscess forms in the perineum*, at a distance from the original site of action—a less frequent complication; threatening retention of urine by compression of the urethra, and urinous abscess by opening internally (p. 504). 7. *Or prostatitis ensues;* sometimes by continuous extension of the inflammatory process along the membrane; more frequently, perhaps, by metastasis. And in severe cases—either originally and innately so, or become urgent in consequence of either mal-practice, or imprudence on the part of the patient—abscess may form in the prostate; usually superficial, as regards the urethra; temporarily causing retention of urine; early emptying itself internally, and rendering urinous abscess not improbable (p. 510). 8. Or, the inflammatory process extends still farther, and more untowardly

—either by continuity, or by metastasis; and *acute cystitis results;* aggravating all the local symptoms, and, by urgent disorder of the system, bringing even life into peril. From the bladder—with or without abscess of that organ—inflammation has extended to the peritoneum, and proved fatal. 9. *Acute rheumatism may supervene;* the joints of the limbs becoming painful and swollen, and the system suffering under inflammatory fever. The knee and ankle-joints are those most frequently and prominently involved. The supervention sometimes takes place during the acute stage, sometimes during the decline; occasionally, the rheumatic symptoms are coeval with those of the gonorrhœa. Or gouty symptoms may be excited, in those of the better ranks, and of advanced years. 10. Very often, in protracted cases, *orchitis takes place;* the inflammatory action sometimes seeming to be transferred to the testicle by metastasis, sometimes seeming to creep along from the posterior part of the urethra to the vas deferens, and thence to be extended to the epididymis and testicle—becoming mainly resident in the former. During the acute stage of such orchitis, urethral discharge diminishes, and may wholly disappear; not necessarily proving a metastasis, but explicable quite on the principle of relief by counter-irritation. As the orchitis declines, discharge usually reappears.

Orchitis may be caused at any period of the case, by a blow on the part, or by imprudence in exercise. If spontaneous in its accession, it usually occurs in the chronic stage; weeks, perhaps, after the first appearance of discharge.

Gonorrhœa is one of those affections which are capable of self-cure. The intensity of the symptoms gradually subsides; the complications which may have occurred are recovered from; and the discharge becomes less copious, and somewhat restored to the mucous character. This state is termed a *Gleet*—embers of the previous burning. There is little or no pain, swelling, or redness; thin discharge is the prominent symptom; with, perhaps, some trouble in micturition. In a patient who has suffered from previous claps, a greater or less degree of contraction in the urethra probably exists; but, in primary attacks, the gleet need not be suspected of such complication. In any case, it is not to be considered that the gonorrhœa has finally ceased—becoming merged in an affection of a different name and kind; for, from but a slight cause—as unusual exercise, imprudence in diet, or such like—reaccession of the inflammatory process may take place; and the gonorrhœa may be revived in even more than its pristine severity.

The *Treatment* of gonorrhœa varies, according to the stage of advancement. At the first onset, what is termed the ectrotic or abortive treatment may be attempted; while the inflammatory process is still nascent, and has not reached the suppurative crisis. The nitrate of silver is used, as in similar affections of the surface; with the view of procuring rapid resolution (*Principles*, 3d Am. Ed. p. 178). It is applied, in the form of strong solution, to the affected part of the mucous membrane—carefully, by means of a glass syringe, so as to pervade the whole diseased surface. Some prefer the form of ointment.[1] A coagulated film is produced,

[1] ʒi to ʒi of lard. The strength of the injection may vary from fifteen to thirty grains in the ounce of distilled water.

which, adhering, protects the villous surface beneath during the passing of urine; besides, the purely antiphlogistic effect of the remedy may be obtained, here, as in erythema; and, not improbably, a third beneficial indication may be fulfilled—the virus may be chemically acted on and neutralized. Such injection or application is made once or twice—at an interval of twelve or twenty-four hours; and strict rest, with antiphlogistic regimen, is observed.[1] The action may be arrested, resolution may rapidly follow, the virus may be destroyed, and the disease may thus be cut short in its outset. Obviously, however, such treatment is applicable only to the very earliest stage—which is seldom brought under the cognizance of the surgeon; in irritable habits it is not likely to succeed; and, under even the most favorable circumstances, there is always a risk of failure, with consequent aggravation of the original disease.

Failing the ectrotic attempt—or, no opportunity having occurred for its practice—the acute or inflammatory stage is met by ordinary antiphlogistic means. And it is well to remember, in reference to this, that the first attack of gonorrhœa is generally the most severe. Rest is enjoined; but, for obvious reasons, this all-important indication is but seldom fulfilled—and hence one cause of this affection often proving tedious and troublesome in its cure. Diet is low; the part is fomented, and by a handkerchief or bandage it is suspended; antimony is given in nauseating doses; the bowels are gently moved; drastic purging does harm, by irritating the rectum, and involving the urethra in sympathy; leeches may be applied to the perineum; and, if uneasy feelings pervade the hips, loins, and thighs, the hip-bath will be found useful. In extreme cases, it may be necessary even to abstract blood from the arm. To mitigate the ardor urinæ, bland fluids are drunk abundantly; as linseed tea, a solution of mucilage, &c. To render the urine less acrid, saline draughts are useful; as, a scruple of bicarbonate of soda, with a drachm of Rochelle salt, dissolved in tepid water, and then mixed with soda water; taken three or four times daily. Bland enemata are useful, in regulating the bowels; and, in the case of a sympathizing prostate, they are of service as a fomentation or poultice to that part. The antimony is of use, not only as antiphlogistic, but also as antiaphrodisiac; and this latter indication is to be assisted by suitable moral treatment on the part of the patient. Camphor, too, and lupulin, are useful in the same way. Should painful erections occur, opiates are given, especially at bedtime; a pill of opium, hyoscyamus, and camphor, is found to be very suitable; repeated as circumstances may demand. And the patient should lie cool at night, with few bedclothes. Sometimes full doses of colchicum are of service, in relieving chordee—especially in those cases which possess the rheumatic complication. Leeching of the affected part is not advisable; the leech-bites are likely to cause swelling, partly by ecchymosis, partly by œdema; and such swelling tends to complication by phymosis or paraphymosis; besides, the wounds are

[1] Some employ the nitrate of silver in another way, for ectrosis; using a weak solution—say two grains to eight ounces of water—and injecting this once every four hours, for ten or twelve times. We would put more faith in the concentrated and less frequent form of application.

liable to be inoculated by the virus, and troublesome sores may be the consequence.

At this stage, ectrotic treatment is not to be thought of. We would not seek for sudden suppression of discharge, were this in our power. If it do occur, it is an untoward event; sure to be followed either by aggravation of the original disorder, or by implication of the prostate, bladder, or testicle, through metastasis. Strong injection, therefore, is not suitable. No doubt, it may temporarily arrest the discharge; but only because such exacerbation of the inflammatory process has taken place, as checks all secretion; pain, swelling, and redness are greater than before; and discharge soon reappears in increased quantity.

The inflammatory crisis having passed over, the sternness of the antiphlogistic treatment is gradually departed from. And certain remedies are given,[1] which by experience are found to exert a specific influence on the urethra; copaiba and cubebs; the former the more suitable at first; given in cautious doses, lest a deleterious amount of stimulus be imparted to the membrane.

As the case becomes chronic, antiphlogistics are gradually abandoned. And, for the state of congestion which remains in the membrane, the direct application of gentle stimuli is found useful. Pressure may be applied, by a compress over the corpus spongiosum; but this is found irksome, and difficult of management. The method of injection is preferable. A glass syringe, with blunt point, and long narrow nozzle, is employed; by means of which—inserted fully into the urethra—application of the injected fluid may be made accurately to the whole diseased surface. Backward extension to the bladder need not be apprehended, the natural collapsed condition of the canal being a sufficient obstacle to this. The fluid injected is at first weak; and its strength is gradually increased, according to circumstances. In nothing is there more room for variety. Some use an infusion of green tea, or other vegetable astringent. Sulphate of zinc is perhaps most commonly employed; or the acetate of zinc; or sulphate of copper; or the salts of iron; or the nitrate of silver; or alum; or strychnia. A favorite injection is the acetate of zinc, with a proportion of opium. Water is passed before injecting, so that the fluid may reach the membrane directly; and, on withdrawing the syringe, the point of the penis is held erect for some time, so as to keep the fluid in contact with the affected part. The operation may be repeated three or four times in the day; but should over-excitement ensue, injection must be wholly discontinued for a time; and when resumed, it must be very cautiously. As already stated, the strength of the injection is gradually increased; and, if it seem to have lost its influence, it is better to change to a different kind, than to increase the first to a strength at all formidable. In fact, the principle of stimulation is conducted as in the use of lotions to a weak sore on the surface of the body (*Principles*, 3d Am. Ed. p. 234). In

[1] These remedies act on the part; as is shown by experiment. If a patient with fistula in perineo have contracted gonorrhœa, and if the whole urine be permitted to pass through the fistula, no benefit will accrue from any dosing with cubebs or copaiba. But when, by shutting up the abnormal aperture temporarily, the urine is made to pass over the whole urethra, amendment is at once observed.

obstinate cases, benefit may be derived from nitrate of silver rubbed on the perineum, so as to act as a smart counter-irritant.

In the truly chronic stage, large doses of cubebs may be given with advantage; regard always being had to the kidneys, lest over-stimulation occur there. And sometimes rapid amendment may be obtained by cubebs combined with copaiba in the form of paste, given in wafer paper—an admirable remedy for the chronic cases, but usually much too stimulant for the early stage. These internal remedies may be employed along with injection. Or they may be alternated. But, in no case, should injection be long and continuously persevered with; otherwise a discharge of the stimulant's own production may be maintained, keeping up a state of congestion in the membrane, delaying the cure, and rendering the occurrence of stricture very probable.

Sometimes the affection is chronic from the first; passive congestion furnishing the discharge. This is liable to occur in patients of sluggish temperament, who have had many attacks of the disease. In such cases, antiphlogistics are never suitable; and the stimulant mode of treatment is adopted from the first.

The casualties of the disease are met as they occur. Chordee requires cool covering of the parts at night, a suitable moral treatment, and sedatives (p. 517). The attack, when spasmodic, may be moderated by immersion of the organ in cold water. Hemorrhage often requires no treatment, being regarded as a salutary occurrence, auxiliary in the treatment; if excessive, it may be restrained by the application of cold, or by pressure, as already described (p. 493). Œdema is relieved by fomentation and poultices. Bubo requires fomentation and rest; and, its first acuteness over, external application of iodine is likely to obtain resolution. Abscess threatening in the penis, or in the perineum, is opposed by increased and concentrated antiphlogistics; if matter have formed, an incision cannot be made too early for evacuation. Affections of the prostate and bladder require their suitable treatment, already noticed (p. 488, &c.). Small cold enemata, containing a moderate quantity of laudanum, are sometimes very useful. And it is well to avoid these attacks, by doing nothing heroically, in the way of injection, after the gonorrhœa is fairly established. With some, no doubt, strong injections are still in vogue, even at an advanced period of the case. But in our opinion, they are warrantable only at the very first, as already stated; and then should consist only of nitrate of silver —which alone seems capable of exerting a purely antiphlogistic influence on the skin and mucous membrane. It is used here, as in inflammatory affection of the mucous membrane of the throat; it forms a protecting crust, allays irritability, and resolves the inflammatory action. The same strength of sulphate of zinc would prove merely stimulant, and would not fail to cause aggravation. Gout and rheumatism are met by their peculiar treatment. And, obviously, it is important to remove the tendency to uric deposit as speedily as possible; otherwise, the passing of this cannot fail to maintain, and probably to increase the urethral excitement.

Thus, according to the ordinary principles of surgery, would we treat gonorrhœa; and with a good hope of success; if the indications

regarding regimen and rest be fully carried out—a difficulty in many cases, as already stated. But there is no disguising the fact, that not unfrequently the disease proves quite intractable; as if determined to run its own course, regardless of the means employed—unchecked, almost unmitigated and unmodified. In such cases, some peculiarity of constitution will generally be discovered; scrofula, gout, or extreme irritability of system. And, for such difficulties, no general rules of treatment can be laid down. Each must be met by what seems most suitable under the circumstances; always avoiding undue activity of practice; and preferring rather that the disease should run its own course, than that by unfortunate interference more serious affections of the prostate, bladder, testicle, or general system should be induced.[1] In general, a tonic treatment is required; specially the preparations of iron and quinia; with the latter, nux vomica has been successfully combined.[2]

Bougies are by some recommended; but we would move them altogether from gonorrhœa to gleet. Their use in the former affection is extremely apt to over-stimulate, causing reaccession of the disease. In gleet, however, they are very serviceable, by obviating any tendency to contraction in the urethra, and removing the congested state of the lining membrane; and sometimes by means of a bougie, the citrine or some other stimulant ointment may be beneficially applied to the anterior part of the membrane. In obstinate cases, with irritability of the posterior part of the canal, nitrate of silver may be applied—cautiously—by means of Lallemand's porte-caustique.

In some cases of obstinate gleet, the discharge seems to be kept up by chronic prostatitis, and to come from the follicles of the gland. Under such circumstances, Chian turpentine, in five-grain doses, often arrests the secretion; seeming to have a special action on these parts.[3]

After discharge has ceased, and uneasy sensations have almost wholly disappeared, great care is still necessary on the part of the patient. Cure is not yet complete. A hearty meal, a debauch in wine, venereal indulgence, a long walk or ride, may reinduce the discharge and pain. Avoidance of all such re-exciting causes, therefore, must be scrupulously observed, until at least a week has elapsed.

As to the period when contagion ceases, opinions differ. Probably, the discharge is most virulent when first displayed—as yet non-purulent in character. Perhaps, as the purulent character is declared, virulence may decrease, and soon disappear. Possibly, the creamy thick discharge may not be different in any respect from the ordinary product of simple inflammation. But such matters are, as yet, not fully removed from uncertainty; and it is well always to approach error on the safer side; holding, for practical purposes, that, so long as there is discharge, there is at least a possibility of communicating infection thereby.

[1] The length of time during which an obstinate gonorrhœa may persist is sometimes great; but scarcely so extreme as that mentioned by one eminent modern authority, who gravely tells us of claps contracted at the peace of Amiens in 1800, being still running in 1840!—*Lancet*, No. 1263, p. 510.

[2] Brit. and For. Rev. July, 1850, p. 226.

[3] Adams on Diseases of the Prostate, p. 35.

Sometimes the eyes suffer by gonorrhœa; and one of two affections may occur. *Gonorrhœal ophthalmia* includes conjunctivitis and iritis. Gonorrhœal conjunctivitis, as formerly noticed (p. 118), is usually the result of direct contagion; virulent gonorrhœal matter having been applied from a second party. The inflammatory process is rapid and intense; and the most active measures are necessary, to prevent serious structural change. Gonorrhœal iritis, on the other hand, is a remote constitutional result of the virus within the patient himself, occurring as a secondary symptom, usually mild in its character, and demanding no severity of treatment. It most frequently occurs in those of a rheumatic habit, and is not unlikely to be associated with affections of the joints. Often, it is accompanied with corneitis.

Secondary symptoms, of any kind, are rare. Sometimes, however, a febrile disturbance is followed by papular eruption, and *gonorrhœal lichen* is said to be established. This, too, is mild. Under anti-febrile measures, the precursory disorder soon yields, and the eruption will not resist simple and ordinary treatment. Like the primary affection, it is capable of self-cure, and may often be medicinally disregarded. Mercury is never necessary. The virus of gonorrhœa is comparatively mild; its seat would seem to be much more in the part than in the system; and, when the latter is involved, it is but slightly.

In some constitutions there is intolerance of copaiba; its use being followed by the appearance of an eruption, of the nature of urticaria, preceded and accompanied by smart constitutional disturbance. Discontinuance of the remedy, with antiphlogistic regimen, is enough.

Gonorrhœa præputialis, sometimes termed *spurious gonorrhœa*, but more correctly *balanitis*, denotes a condition of the preputial membrane and investment of the glans, similar to that of the urethral lining in gonorrhœa. The disease may be an accession to gonorrhœa; or it may occur independently of this, from the same cause. Or it may be altogether simple in its origin; resulting from accumulation of acrid secretion, from retention of calculous matter, or from external injury. The part is red, swollen, partially abraded by superficial ulceration, and discharges a profuse puriform secretion. The prepuce is œdematous; and there is more or less trouble in micturition. Treatment is simple. An ectrotic result by nitrate of silver is almost always in our power. The glans, having been exposed, is pencilled lightly over by nitrate of silver in substance; or, what is better, by a strong solution of it. Within four-and-twenty hours, the intensity of inflammatory action and the amount of secretion will be found greatly diminished. And, very probably, another application will complete the cure. Of course, rest and antiphlogistic regimen are not neglected.

Warts are a frequent concomitant of the foregoing affection; or they may form independently of it. They are usually clustered round the corona glandis, and on the frænum (*Principles*, 3d Am. Ed. p. 386). The best method of removing them is to take away the projecting portions by knife or scissors, and then to touch the stools with an escharotic; the nitrate of silver, firmly applied, may prove sufficiently powerful; or some one of the other suitable destructives may be used, as bichloride of mercury, dissolved in alcohol, ʒi to ℥i; equal parts of savine powder

Fig. 227.

Warts on the Penis.

and burnt alum; acetic acid, or a strong infusion of tormentilla officinalis.

A more genuine form of *spurious gonorrhœa* occurs, when, from some cause, other than the application of gonorrhœal matter, inflammatory action is kindled in the anterior part of the urethra, and furnishes discharge. The inflammatory process is common, not specific. The symptoms are comparatively mild; and their duration is short. Ordinary antiphlogistics suffice for cure. The more common exciting causes of such an affection are—the internal use of cantharides, or other irritants; the application of acrid female secretions in marital intercourse; injury done by instruments, or by the passing of calculous fragments; external injury of any kind; sympathy with the rectum.

Gonorrhœa in the Female.

The female suffers comparatively little from gonorrhœa. For a few days only the acute symptoms persist, and the chronic stage is attended with but little discomfort. The parts affected are the urethra, as in the male, the vulva and exterior of the vagina, and the os uteri; the last-mentioned part frequently becoming affected by superficial ulceration. Sometimes the inguinal glands enlarge sympathetically. The prominent symptoms are—discharge, painful micturition, pain and swelling in the vulva, œdema of the præputium clitoridis, uneasiness in sitting and walking; at first, some constitutional disturbance; often an aching in the back and loins. Treatment is simple. At the outset, an ectrotic result may be obtained, the vulva being painted over by nitrate of silver. Failing this, during the short acute stage, recumbency is enjoined, with antiphlogistic regimen; the parts are diligently fomented; and, if need be, demulcents are given freely. Afterwards injections are to be used, of greater strength than in the male—the pelvis being elevated during, and for some time after injection, so as to prevent premature escape of the fluid; and a piece of lint, soaked in the stimulant solution, may be kept constantly retained in the vulva. Gallic acid may be useful internally; and, ultimately, a tonic system of general treatment may be expedient.

Young girls are liable to suffer from a spurious gonorrhœa, caused by some intestinal, rectal, vesical, or general irritation; and consisting of an excited, and perhaps excoriated state of the vulva and orifice of the vagina, with discharge. It yields readily to removal of the cause, followed by the simplest local treatment. A knowledge of its nature and origin is obviously of much importance, in a medico-legal point of view.

The true gonorrhœa is apt to be confounded with leucorrhœa; but may generally be distinguished, by attention to the history of the case and its accompaniments; also remembering that in gonorrhœa there is

vesical and urethral disorder, with tendency to glandular irritation in the groins, while in leucorrhœa, these affections are comparatively uncommon.

Syphilis.

This includes, as a general term, all the diseased states, local and constitutional, primary and subsequent, which follow, and are caused by, the inoculation of venereal poison. The action of poisons has already been considered (*Principles*, 3d Am. Ed. p. 608); as well as the probability that there is here a double process of zymosis. The virus, settling on and in the part, accumulates there, and, at the same time, excites an inflammatory process, soon ending in true inflammation; and this always causes suppuration and ulceration—sometimes sloughing. This constitutes the *Primary* or *Local symptoms*. From the specific sore, thus produced, absorption takes place, after the acute crisis of inflammation has passed (*Principles*, 3d Am. Ed. pp. 115 and 148). And, by absorption, the virus enters the system, through the circulation; more or less rapidly, and in greater or less quantity. In the system, a second zymotic process is established; the poison is multiplied; and, acting perniciously on the frame, it declares itself by fever and eruption—these constituting the *Secondary* or *Constitutional symptoms*. By such an outbreak, the poison may be fully eliminated; and, if so, then the disease is at an end. If, however, elimination is incomplete, then other affections—of bone, skin, and mucous membrane—make their appearance at a still more remote date; and these are termed *Tertiary symptoms*.

The venereal ulcers, or primary sores, are of different kinds; and these different kinds are liable to be followed by corresponding variety in the secondary symptoms. Hence it has been inferred, that there are varieties in the originating virus—that there is a plurality of poisons. At present, the question is involved in much uncertainty. But for practical purposes, it is sufficient for us to know, that all venereal sores are not alike in their characters, progress, and results; that at least four different varieties exist, and can readily be discriminated; and that each of these requires peculiarity of treatment.

But, in the first place, it is important to observe, that all sores of the penis are not venereal; and, farther, that all sores of the penis, caused by impure sexual intercourse, are not necessarily of this nature—the product of a specific virus. The penis is as liable as other parts to ordinary causes of the common inflammatory process; and common sores may result. Again, it is liable to be excoriated during coition; and a sore may form in consequence, quite unconnected with inoculation of any virus. And, also, the part is liable to herpetic eruptions, of quite a simple nature.

Herpes of the penis usually occurs on the integuments of the body of the organ; sometimes it forms on the preputial lining, behind the glans. It may be caused by the contact of acrid female secretions—not virulent; or its accession may be altogether unconnected with sexual intercourse. It is known by the character of the vesicles; their plurality, form, speedy formation, and early disappearance. Rest,

cooling medicine, and some simple soothing application, constitute the necessary treatment. Patients once affected by it are very liable to its recurrence.

Simple abrasion is known by its immediate appearance, by absence of the preliminary inflammatory process and pustular formation, by its superficial extent and irregularity of form, by the absence of true ulceration, and by speedy assumption of the healing process. It heals under ordinary simple means.

Common sores are known by the history of their production, and by absence of the characteristics of the venereal ulcer. If any doubt exist, it is expedient to treat the sore, locally, as if it were really venereal. Thus all risk, by mistake, is averted from the patient. And, if it be considered of importance to arrive at certainty on the subject, the test by inoculation may be had recourse to. A portion of discharge from the sore is inserted, by the point of a lancet, in the inside of the thigh; if the virus be present, a succession of results will occur as in the case of other inoculations; active congestion will form, then pustular formation, and then ulcer. By the third day, the characteristics will be sufficiently plain.[1] And then, by freely rooting out the forming pustule by means of an escharotic, propagation of the disease is prevented.

I.—*The Simple Venereal Ulcer.*

If previous excoriation, or other breach of surface exist, the sore may declare itself at once; the incipient inflammatory process becoming apparent almost immediately after connection. More frequently, the virus has to find its way through entire skin or mucous membrane. And a day or two, consequently, may be occupied by a period of incubation —ranging from one to ten, or more.[2] Then the inflammatory process, causing pustular formation and ulcer, advances, as already stated: ulceration being generally established by the sixth day from the time of infection. The progress may be conveniently divided into three stages.—*First*, that of inflammatory action and pustular formation. Redness forms, with itching and heat: in the centre of the redness vesication takes place; the contents of the vesicle become purulent, constituting a pustule; this breaks, with or without scabbing, and discloses an acute ulcer beneath. The *second* period is that of ulceration; occupying, also, it may be said, from three to ten days. The advancing sore is usually of a circular or oval form, excavacated, of pale surface, surrounded by a bright inflammatory areola, and furnishing a thin ichorous discharge. This is the period of infection, inoculation, and arrest by cauterization. The thin ichorous discharge, not yet truly purulent, is certainly most charged with the virus, and consequently most likely to propagate the disease by contagion. It is now that the most favorable

[1] For detail of the results of venereal inoculation, see Ricord, *Lancet*, No. 1278, p. 225.

[2] There seems good reason to suppose, that in general the virus begins to act very soon after its application; within a few hours, in most cases; and that the examples of apparently protracted incubation depend, chiefly, on the circumstance of the poison having been temporarily intercepted, as it were, by a hair follicle, a hardened portion of cuticle, or other obstruction.

opportunity exists for attempting the test by inoculation—if such be desired. And it is only at the early part of this period, that we have it in our power, by converting all into an instant slough, to extirpate the disease while it is yet wholly local. The *third* stage is that of reparation; the sore speedily showing the characters of the weak class (*Principles*, 3d Am. Ed. p. 233). Tall, pale, and flabby granulations sprout up, above the level of the surrounding parts; and the vascular areola diminishes, in both extent and intensity. In this state, the sore may remain stationary for many days. But, on the healing process being begun, a *fourth* stage may be said to be in progress—that of cicatrization.[1]

The negative signs by which this sore is distinguished, are: the absence of surrounding induration, no elevation of the edges, and no tendency, to phagedæna. Its ordinary site is on the prepuce, and in the sulcus behind the corona glandis; often by the side of the frænum; occurring, in short, in the parts most susceptible of, and most exposed to contagion, and where the virus is most likely to nestle, overlooked.

All sores near the frænum are unfavorably situated. The second stage is of long duration, and ulceration is acute; the sore continues to enlarge; often it burrows beneath the frænum, causing perforation; and reparation seldom advances, until the frænum has been wholly destroyed. In all such cases, therefore, it is well to abbreviate the process, by division of the frænum at once; care being taken that troublesome hemorrhage do not ensue, from the small but active artery which generally shows itself at the time of incision.

In treatment, early application is of the greatest importance. For it is only during the first few days that we can be certain of success in the ectrotic attempt. Some authorities extend the favorable opportunity to the sixth day, from the first symptom of infection; and some include the whole period of the second or ulcerative stage. All seem agreed that, within the first three or four days from the application of the exciting cause,[2] it is certainly in our power to root out the disease: "punching it out," as it were; converting the poisoned ulcer into a simple sore; and preserving the system quite untainted. For this purpose, an escharotic is freely applied; nitrate of silver—or, what is more certain, the potassa fusa—pointed, inserted accurately within the sore and pressed there firmly; the fluid exudation being wiped up, as it threatens to overflow. Water-dressing is applied, until the eschar separates; and then the surface beneath is anxiously scanned. If it present the characters of a simple and healthy sore, water-dressing is continued, and healing advances. If, however, the tawny surface and angry appearance of a still virulent ulcer show themselves, the escharotic is reapplied. And such repetition is carried out, from time to time, until a satisfactory clearing has been obtained. If profuse and offensive discharge exist, it may be well to medicate the water-dressing, from the first, by one or other of the chlorides.

[1] On the glans there is little or no reparative action by organization of new material, whatever kind of sore exist; consequently, there the cicatrix is always depressed, and loss of substance is permanent.

[2] Ricord guarantees immunity if ectrotic treatment have been thoroughly applied within the first four days from the application of the virus.

The healing process having begun, simple water-dressing should not be long continued; for, sores on the penis, even of a simple nature, tend speedily to the characters of the weak sore. Early medication, by zinc or otherwise, is accordingly required. If, notwithstanding, the granulations threaten exuberance, there is no better plan than to touch the elevated surface, every second day, with the nitrate of silver, lightly; applying water-dressing intermediately. During the treatment, rest is of the greatest importance; and the organ should also be suspended, by a handkerchief or bandage.

If the case be seen too late to admit of ectrotic treatment, the sore being in the third or reparative stage, the application of nitrate of silver is still useful, by subduing the exuberant granulations, and expediting the healing process. We cannot now save the system from contamination, absorption having already been busy. But we may diminish the amount of taint, by shortening the period during which absorption takes place; and, besides, the nitrate may probably act decomposingly on the remaining local virus. Experience tells us, that the more speedily the sore is healed, the less is the likelihood of the occurrence of secondary symptoms.

Warts are not an unfrequent complication. They are subject to the same treatment, and are of the same nature, as those which attend on gonorrhœa (p. 521).

The secondary symptoms which occur, at a period of from three to six weeks after infection, if the ectrotic attempt have failed, or have not been practised, are usually either exanthematous or papular, venereal roseola, or venereal lichen. The eruption is preceded by fever, and is accompanied by an affection of the throat, similar to what attends other eruptions of the same class. The tonsils, and fauces in general, are red, raw, swollen, and painful; sometimes invested by an aphthous coating, sometimes superficially abraded. The eruption is chiefly situated on the trunk, more especially on the back and belly, but the face and limbs are not exempt. Sometimes there is mere discoloration of the skin, in numerous faint spots.

A patient having begun to complain, at the ordinary time of accession, of such symptoms of general disorder as usually usher in the secondary symptoms, it is our object to favor an early and full appearance of the eruption; for, thus the febrile condition will be relieved, and what seems the natural effort towards extrusion of the poison from the system will be assisted. To check the skin affection, were as unwise as to attempt repression of the eruptions of measles, smallpox, or scarlatina. The bowels are gently acted on, and a warm bath is given. Regimen is antiphlogistic, and confinement to the house is enjoined. Antimony is given. with more than one object in view; it tends to moderate fever, at the same time determining to the skin, and there is good reason to believe that it is also an auxiliary of no mean power in elimination of the virus. The eruption, having attained its acme, gradually fades. At the same time, the affection of the throat recedes, but, in general, amendment here may be expedited by use of the nitrate of silver. By warm bathing, restriction of diet, avoidance of exposure, and general attention to the skin—iodide of potassium, sarsaparilla, or

other alteratives being given if necessary—purity of the surface is restored, and the cure is complete. It is seldom that the more decided but more dangerous alterative, mercury, requires to be had recourse to. Its sparing exhibition, only as an alterative, is expedient, however, when the eruption either proves obstinate in its first attack, or tends to sundry recurrences, under the ordinary treatment. Tertiary symptoms need not be dreaded.

II.—*The Ulcer with Elevated Edges.*

In this, a compound of the irritable and inflamed sores, of the general surface (*Principles*, 3d Am. Ed. pp. 244 and 246), the reparative stage is late, not occurring until at least two or three weeks have elapsed. The excavated surface is of a brownish hue, and the edges are elevated, not only above this raw surface, but also above the surrounding parts. There is no surrounding induration, and there is no phagedæna, but, sometimes, the ulceration is acute and rapid, destroying the parts, by persistence of acute inflammatory action, almost as formidably as if by phagedæna, more especially if the sore be situated near the frænum. Treatment is the same as for the former class of sore. But, if the healing process be obstinately deferred, in cases too late for ectrotic treatment, mercury may be cautiously administered; a blue pill, or a pill of iodide of mercury, being given, night and morning, until the characters of the sore show amendment. Even this cautious dose, however, is not expedient, until the more simple and safe means have been fairly tried and found ineffectual.

The partially irritable is liable to pass into the thoroughly inflamed sore, here as elsewhere. In such circumstances, all escharotic or otherwise irritant applications must be abstained from, until, by the ordinary means, inordinate inflammatory action has been subdued. In the irritable condition, the oxide of silver is sometimes of use, in the form of ointment.

If the ectrotic attempt have failed, the occurrence of secondary symptoms is extremely probable. Antecedent febrile disturbance is more considerable than in the first class of cases, and the eruption is usually of either the papular or pustular character, more frequently the latter. The pustules are chiefly situated on the chest, back, and face; occasionally, they degenerate into irritable sores, but the majority fade, and heal by incrustation. Their site is marked by brownish discoloration, sometimes of obstinate persistence. Bubo is not unlikely to occur, more especially if the patient fail to observe recumbency; the lymphatic enlargement not, in general, dependent on a common inflammatory process, excited by simple irritation on the penis, as in the case of gonorrhœa, or simple abrasion, or herpes, but on a specific inflammatory process, caused by propagation of the virus from the original site, and lodgement of it in the ganglia. Iritis, too, may occur, constituting a serious complication. Affection of the throat is tolerably severe, and the tonsils may display extensive aphthous ulceration.

The secondary eruptions require the same general treatment, as those which follow the first class of sore. Bubo is treated by rest, fomenta-

tion, &c.—perhaps by leeching. Iritis demands its own peculiar management, formerly detailed (p. 185). Only in the slightest forms, dare mercury be withheld. Its exhibition here is not antisyphilitic, but antiphlogistic; and it is managed accordingly. The throat requires soothing by inhalation, in the first instance; afterwards, the nitrate of silver, in substance or in strong solution, applied every second day, will remove irritability in the breach of surface, and expedite cicatrization. If either the throat or the skin affection prove chronic and obstinate; or if, after deceptive disappearance, reaccession occurs—mercury may be given, sparingly; rather, however, as a last resource, than as an ordinary part of the treatment. Antimony and the iodide of potassium, with attention to hygiene, prove sufficient in the greater number of cases.

A troublesome sore sometimes forms on the orifice of the urethra; and it generally is of this class. Constantly exposed to irritation, by the passing of urine, it is slow to heal; it may, by persistence of ulceration, cause considerable loss of substance; and then cicatrization cannot occur, without producing more or less contraction of the urethra at that part. Hence, it is obviously of great importance to detect its presence early, and to make sure of the ectrotic treatment. During the subsequent healing, light application of the nitrate of silver is very suitable; this forming an adherent incrustation, protective of the parts beneath. And this protection may be farther aided, by the temporary application of an oiled piece of lint, on each margin of the orifice during micturition.

Sores sometimes form more within the urethra; causing much trouble, by pain, swelling, discharge, and liability to constitutional sequelæ; and rendering the occurrence of troublesome stricture all but inevitable.[1] They are treated by injections, carefully introduced so as to insure their application to the sore; and of such a kind as would be applied to the ulcer in an ordinary site. After cicatrization, the occasional use of a bougie is expedient, to obviate the tendency to contraction of the canal.

III.—*The Hunterian, or True Chancre.*

This belongs to the indolent class of sores; but, unlike those on the general surface of the body, is usually indurated from the first. The antecedent inflammatory process is chronic, accompanied by copious plastic exudation, around and beneath the forming sore; giving an almost cartilaginous hardness to its base and margin, which feel as if a split pea had been inserted into the textures. The sore is circular, and excavated; the surface, of a tawny or brownish hue, seems as if recently scooped out by an instrument; reparative action is faint, and long delayed; sometimes, the site of granulation is occupied by a thin, ash-colored, adherent pellicle. There is no surrounding vascular areola, after the sore has fairly formed. The ordinary sites are the glans penis, the preputial reflexion, and the integument of the

Fig. 228.

A Venereal Sore on a common site. The characters are chiefly those of the Hunterian chancre. (After Acton.)

[1] The presence of such concealed sores in connection with gonorrhœa, probably gave rise to the belief that gonorrhœal matter had the power of producing syphilis.

body of the organ; the first the most frequent, and showing greatest induration. While other kinds of sore may occur in one or two places, this form is in general solitary.

Treatment is based on the same principles as that of the preceding varieties. Not only the sore, but also the callous induration around and beneath—in which, it is probable, the virus mainly resides—must be destroyed; and for this purpose no weaker caustic than the potassa fusa is necessary—freely applied, perhaps with repetition. Neither is it enough merely to obtain cicatrization, leaving the hardened base and margin but little altered, if at all. These, constituting essential parts of the disease, must be got rid of. And if, after repeated use of the escharotic, hardness still remain, then removal by discussion is to be sought; by internal means—mercury, or the iodide of potassium; and also by the local application of these substances. It is better that some farther contamination of the system, by rapid and final absorption, should be risked, than that the part should remain a constant zymotic source of propagation. And discussion may be expedited by the application of pressure, when the sore is so situate as to admit of this; a piece of folded lint being placed over the part, and retained by an elastic band.[1]

It may happen, that early and free use of the potass thoroughly succeeds in obtaining the ectrotic result; the sore completely changing its character, and healing up, without risk of secondary symptoms. More frequently, however, we fail in this; probably from being too late in our interference; and the sore refuses to change under local means alone. Then mercury is necessary; given with more freedom than in any of the former cases, though still with caution; never pushing it to excess of ptyalism, and always ceasing from the administration, at least for a time, so soon as amendment seems fairly begun in the sore. It is invariably our object to accomplish the desired end, at as little cost of the mineral as possible.

When the ectrotic attempt fails, as is not unlikely, secondary symptoms are almost certain to occur. The eruption is scarcely preceded by fever, and is unaccompanied by it. Faint, brownish spots, or *maculæ*, appear—chiefly on the trunk; or, as more frequently happens, an eruption of copper-colored blotches occurs, and these subsequently become scaly—evincing the characters either of lepra or of psoriasis. As the primary sore is considered the true *Chancre*, so the constitutional affection may be termed true *Syphilis*, or *Pox*.[2] The throat is involved; but, as in the other symptoms, this shows but a dull amount of inflammatory action. One or both tonsils are found occupied by deep ulceration; often there is a sore on each, of characters very similar to those of the primary ulcer. For such affections of the system, there is no remedy equal to mercury; and it seems generally agreed that, when true syphilis has declared itself, the cautious use of that mineral should be immedi-

[1] Acton, Lancet, No. 1226, p. 220.

[2] By many, the term "chancre" is employed to denote all kinds of venereal sore; as "cancer" is often made to comprehend all kinds of malignant disease. When a special meaning is intended to be affixed to "chancre," however, it is understood to include only this fourth class of sore.

ately begun. No heroic dosings are necessary, however; an alterative course is still all that is required; continued till amendment appear; and perhaps revived, at intervals, until final clearance of the poison has been effected. Bubo and iritis, if they occur, are met by their appropriate treatment; in the latter affection, mercurialization may be conducted with especial freedom—for a marked tolerance of the remedy will certainly be found.

If the primary and secondary symptoms have not been actively and conclusively dealt with, tertiary symptoms are extremely probable; showing themselves after the lapse of some months. The periosteum of the bones which are most exposed—tibiæ, ulnæ, clavicles, cranium, sternum—suffers by a chronic inflammatory process; and the bones themselves are similarly involved; creating the condition of Node (*Principles*, 3d Am. Ed. p. 394), sometimes circumscribed and acute, more frequently chronic and diffuse. The joints, too, are affected with chronic swelling and pain. Fetid, ill-conditioned sores may form between the toes. Condylomata may appear on the nates and perineum. Irritable sores may form on various parts of the general surface. The glands of the neck may be chronically enlarged; especially behind the ears. The testicles may swell; either solid, or with serum in the tunica vaginalis. The throat may again become attacked by ulceration—of a more diffuse and acute character; the palate may be involved, and exfoliation may ensue. And one or both groins may be occupied by indolent bubo. The more ordinary of the tertiary symptoms, however, when mercury has not been abused, are the ostitic and periostitic affections. And for these, as well as for the tertiary symptoms in general, iodide of potassium is found to be the preferable remedy; begun in full doses, and regulated according to the effects produced. Eight grains, thrice daily, in solution, is a justly favorite form of exhibition; diminished when the physiological effects are threatened to be produced.

There is a modification of this class of sore, consisting of induration merely. A callosity forms, after impure intercourse; and it may, or may not ulcerate, at a late period. It is equally prone to contaminate the system as the true chancre; and requires precisely similar treatment. Cure is not complete, so long as any degree of hardness remains.

It is not to be forgotten that this form of disease may be simulated, by sores unconnected with venereal virus. From accidental circumstances, induration may occur here as elsewhere; indolent characters superseding the weak in an ordinary breach of surface. Or, again, a venereal sore, originally of the first or simple class, may become indurated, in consequence of frequent and unnecessary use of caustic, or from other sources of irritation. Such simulations, of course, warrant neither the prognosis nor the treatment of true chancre.

IV.—*The Phagedænic Ulcer, the Sloughing Ulcer, and the Sloughing Phagedæna.*

Phagedæna, here, as elsewhere, may be either acute or chronic. The latter is not very formidable; being, as it were, only a degree more

troublesome than the worst forms of the second class of sore. Its most common site is the root of the glans; but, not unfrequently, it burrows from this, beneath the fascia of the penis, producing much induration and swelling of the organ, with copious fetid discharge; advancing unseen and unchecked, till much mischief is done; probably opening into the urethra, at one or more points; at all events, laying the foundation of tedious sinus, with perhaps a permanently enfeebled and abnormal state of the organ. Sometimes, also, this form of sore attacks the posterior part of the dorsum of the penis, and burrows beneath the pubes.

Acute phagedæna, the sloughing sore, and the sloughing phagedæna, present the same characters here, as elsewhere (*Principles*, Am. Ed. p. 246, *et seq.*); attacking the glans and prepuce indiscriminately; and in a short time effecting the most destructive ravages. The accession and progress of the sore, or sores, are accompanied with marked constitutional disturbance, of the nature of irritative fever, tending manifestly to prostration. The sinister characters may declare themselves from the first; or, for a day or two, the sore may seem but an unusually foul and active sample of the second class, attended with an unusual amount of constitutional disturbance; and then, without any apparent exciting cause, rapid aggravation takes place, in both the local and constitutional symptoms; constituting what is ordinarily termed the "black pox." Sometimes such aggravation would seem to be accelerated, if

Fig. 229. Fig. 230. Fig. 231.

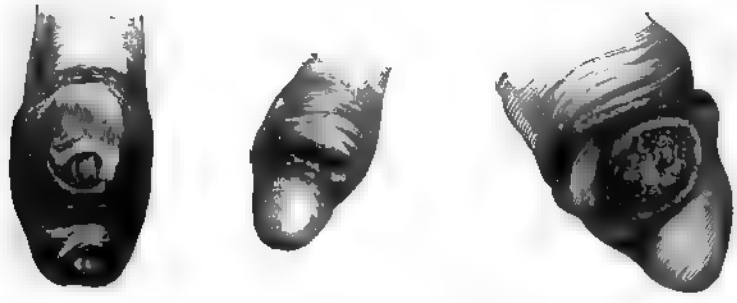


Fig. 229. The Sloughing Sore, as affecting the penis. The prepuce almost gone; the glans going. (Acton.)
Fig. 230. Acute Phagedæna, burrowing beneath the integuments of the penis. (Acton.)
Fig. 231. Chronic Phagedæna; with surrounding hardness, almost equal to that of true chancre. (Acton.)

not caused, by imprudent administration of mercury. And sometimes mercurialism would seem to have the effect of converting an originally simple sore, of the first or second class, into a tolerably close imitation of this of the fourth. It is important, however, to discriminate between the sore originally of a bad kind, and that which, by casualty, has become temporarily occupied by a slough, from overaction; for the suitable treatment is very different. Active and painful local management is required in the one; rest and simple antiphlogistics are sufficient for the other.

As the disease advances, constitutional disturbance increases propor-

tionally; and this, becoming decidedly typhoid, may prove fatal. Or it may be assisted by hemorrhage. Moderate loss of blood, however, may have an opposite effect, in the less urgent cases; occurring in quantity sufficient to affect the part, resolutively; and not to such an extent as to affect the system, depressingly. In most cases, a fatal result may be avoided; but, in many, serious mutilation is inevitable. The disease, fortunately, is comparatively rare; and is chiefly found in maritime towns, where, by sailors and the lower class of prostitutes, sexual vice is extravagantly perpetrated.[1]

To change the character of chronic phagedæna, no local application is so powerful as the fluid nitrate of mercury; diluted, so as to have an alterative rather than an escharotic effect. The primæ viæ are attended to; regimen is antiphlogistic; warm bathing is useful; and strict rest is enjoined.

Acute phagedæna, the sloughing phagedæna, and the sloughing sore, require the active treatment, locally and generally, suitable to this form of disease (*Principles*, 3d Am. Ed. p. 249); the clearing out of the primæ viæ, followed by sedatives and anodynes; the stern use of an active escharotic, the characteristic moisture of the sore having first been removed; strict rest, and an antiphlogistic regimen; but, at the same time, a careful watching of the constitutional symptoms, lest typhoid tendency suddenly supervene, and stimulants become indispensable. Cover the part in a poultice, treating the case expectantly, as is the manner of some; and serious mutilation will be the probable result.

In the outset of an urgent case, one is tempted to imitate nature, and abstract blood. But, generally speaking, the experiment is a rash one; it may irreparably depress the system. While, however, bleeding from the system is unwarrantable, abstraction of blood may sometimes be made from the part, safely and well. A pendulous, half-dead portion of prepuce, soon about to slough wholly, may be cut off by the stroke of a bistoury; and bleeding from the wound may be encouraged, to such an extent as may be deemed suitable and safe.

Sometimes paraphymosis occurs; as can be readily understood, on account of the swollen state of the parts. This must be instantly remedied by replacement, if possible; if not, a free, liberating incision should be made on the dorsum of the penis, at the constricted part; otherwise, the progress of destruction cannot fail to be frightfully aggravated. After the acute stage is over, the internal use of iron may sometimes be employed with much benefit.

After cicatrization has been completed, it may be in our power par-

[1] "Most of the young creatures who are brought from that genteel place, Swan-alley, afflicted with phagedænic ulceration, have had very little wholesome food; they are generally kept by Jews and Jewesses, who give them plenty of gin, though but little proper nourishment; they are half-starved, and, more or less, in a continued state of excitement and intoxication, having connection with lascars, and other dirty foreign seamen, as many times in the day as there are hours. In this manner, their constitutions must soon get into a very disadvantageous state for the favorable progress of any disease whatever; and we cannot wonder that their impaired and imperfectly developed frames, their course of life, and uncleanliness, should promote phagedænic ulceration, and give it an unusually severe character."—*S. Cooper.*

tially to remedy the damage done, by closing abnormal apertures in the urethra by means of autoplasty.

Mercury is never advisable. Persistence of the febrile disturbance is itself a sufficient contraindication. Besides, experience plainly tells us, that its local effect is to accelerate sloughing and phagedæna; seeming to favor the softening and undoing of organized structure, and so fitting it for ulceration, while tendency to this is already excessive.

Obviously, in such cases, ectrotic treatment is not always within our power. The local disease may spread too rapidly to permit isolation of the virus, with extirpation of the affected part; at the same time, however, the very acuteness of the inflammation is unfavorable to absorption; and, consequently, the occurrence of secondary symptoms is not so frequent as might otherwise have been expected. When they do occur, their accession is preceded by serious constitutional disturbance, similar to what attended on the local symptoms, but generally less urgent. The eruption may be pustular; the pustules large rather than numerous, giving way, crusting, and degenerating into foul sores of either the inflamed or irritable characters. Or it may be vesicular; large flat bullæ forming, with contents at first serous, but afterwards purulent; giving way, crusting and forming unhealthy sores beneath. Or it may be tubercular; broad tubercles forming, which enlarge and suppurate slowly, ultimately degenerating into loathsome and extensive sores. The throat is the seat of asthenic inflammatory action; ulceration quickly forms, and spreads both in width and depth—by sloughing, by phagedæna, or by both. One or other of the large vessels in the neighborhood of the tonsil may be opened into, and fatal hemorrhage may ensue. The larynx may be involved; ulceration actually extending to it; or œdema, preceding the ulceration, may cause most urgent symptoms. Either event may prove fatal. Bubo is seldom absent, at some period of the case. And when, by suppuration, an opening has taken place, this is apt to assume the same characters as the primary sore; by this time, perhaps the gland being itself the residence of the same poison—by absorption and zymosis.

The treatment of these symptoms is fraught with much anxiety. Still, mercury is withheld. It would but aggravate. Regimen is antiphlogistic; and antimony is given guardedly—so as not to prostrate; in many cases, it is well to combine it with gentle opiates. Warm bathing is grateful, and may relieve the febrile disturbance. Evacuants are obviously calculated to be of service; acting on skin, bowels, and kidneys; yet still, not so as to cause prostration. The sores on the surface are cleaned and calmed, by poultice or water-dressing; afterwards they are dressed with nitrate of silver, chloride of soda, or other lotion. The fauces are diligently fomented by inhalation; the sores are touched with nitrate of silver in substance, or with the fluid nitrate of mercury slightly diluted;[1] and, after the acute stage has passed

[1] In touching the throat with nitric acid, or fluid nitrate of mercury, of any strength, great care must be taken to avoid redundancy of liquid in the sponge or lint with which the application is made; otherwise, a drop may fall down, and, alighting on or in the glottis, may cause the most alarming dyspnœa.

benefit will accrue from moderate counter-irritation. Then diet is gradually amended; and when all has passed into the chronic stage, much advantage may result from judicious use of the iodide of potassium. Should iritis occur, a serious difficulty is engendered. We wish to give mercury to save the eye; and we at the same time wish to withhold it, to save the constitution. At first we trust, therefore, to smart loss of blood from the neighborhood of the part, and to the substitution of turpentine for mercury as the specific internal remedy (p. 135). Only after this has failed, are we driven to a cautious use of the mineral.

The tertiary symptoms which may follow this form of disease, are of a formidable character; more especially, if mercury have been given. Bones are liable to ostitis, and its highest results; abscess, ulcer, caries, necrosis. Tubercles form on the skin, larger, more painful, and degenerating into worse sores than those of the secondary class; often crusting prominently, and assuming the characters of Rupia. Obstinate sarcoceles and hydrosarcoceles form. The throat is liable to be again attacked; in a more chronic, but very obstinate ulceration; with the same risk by hemorrhage; and with the additional risk of ghastly deformity, by involvement of the bones of the palate and nose.

It is in this form, associated with a strumous tendency of system, and maltreated by the false mineral specific, that deformity and death are most likely to occur. But, happily, both of these untoward events are nowadays rare. Modern treatment does not aggravate, if it fail to cure. It consists in ordinary attention to the general functions, with careful regimen—not low but temperate; and in the administration of sarsaparilla, guaiac, or other simple alteratives, so long as febrile excitement or stomachic and intestinal derangement may remain. The primæ viæ having rallied, and febrile disorder having ceased, the iodide of potassium is brought into play, internally; and is patiently persevered with—hygiene, meanwhile, being not neglected. In obstinate cases, the "liquor hydriodatis arsenici et hydrargyri" may be of service.

Condyloma.

Condylomata are excrescences of the integument; sometimes white, sometimes of a mucous appearance; sometimes dry, sometimes exhaling a thin discharge; forming on the nates, around the anus, in the folds of the thighs, on the perineum, on the scrotum—in the female on the labia. They occupy a doubtful place in the arrangement of primary, secondary, and tertiary symptoms. And there seems little doubt that they are occasionally to be found, pertaining to all the three classes. Discharge trickling from primary sores—more especially from the true chancre—and accumulating filthily in the neighboring folds of integument, doubtless produces such irritation, and probably inoculation, as may lead to condylomatous formation; and this may then be regarded as partly of a secondary and partly of a primary character. Condylomata may also show themselves along with ordinary secondary symptoms; though this is rare. Again—months after the primary attack, and after a secondary train of symptoms, too, have run their course—

condylomata may appear, for the first time, among the tertiary symptoms; and this is most frequently observed after true chancre. Besides, there is no reason to doubt that, not unfrequently, condyloma forms as

Fig. 232.

Condylomata. (Acton.)

the primary and only form of infection; whether communicated by a distinct variety of poison, or not, we are not at present in a position to determine.

To the primary condyloma a peculiar kind of constitutional affection succeeds. An "exanthematous eruption of a mottled appearance, and of a red or brownish color, occurs; sometimes preceded by vesication or scaliness, but never by pustules; sometimes elevated," and approaching to the tubercular character. The throat is raw and painful; and, on the mucous surface of the lips, cheeks, palatine arches, and tonsils, "peculiar, white, elevated patches are found; having the appearance of parts touched with the nitrate of silver, or coated with milk; irregular in form, and presenting occasionally superficial ulcerations on their surface."[1] By some it is supposed that this affection is identical with "sibbens;" which at one time used to prevail much in this country.

The treatment of condyloma consists in repeated applications of sulphate of copper, nitrate of silver, or more active escharotics, until the excrescences disappear;[2] in rectification of the primæ viæ; and in the internal use of iodide of potassium. The affection of the throat and mouth is treated with nitrate of silver, in substance or solution, applied every second day. The internal remedies—it is to be understood—are required only for the constitutional symptoms. Primary condyloma is removable by local treatment—perhaps ectrotic—in the same way as any primary sore.

[1] Skae, Northern Journal of Medicine, April, 1844.
[2] Sometimes dusting with calomel is of service.

Bubo.

Venereal Bubo, like Condyloma, is with difficulty appropriated to a class; for it, too, may be found of primary, secondary, and tertiary occurrence. It is a question, whether or not bubo may be truly a primary form of syphilis; occurring without the formation of sores, of any kind, on any part of the penis; capable of producing venereal sores, by inoculation of the matter which forms by its earliest suppuration; and liable to be followed by constitutional pox. The probability is that bubo is never thus "*d'emblée;*" and that it is always the result, more or less remote, of venereal ulcer; the consequence, sometimes, of simple extension of the inflammatory process along the lymphatics; more frequently arising from angeioleucitis, not only induced but maintained by the virus —which may become resident and accumulated within the affected glands. In gonorrhœa, sympathetic bubo is probably the consequence of simple excitement. Inguinal swelling may, indeed, precede the appearance of discharge; the very first part of the inflammatory process having proved a sufficient stimulus to the lymphatics.

True bubo, as it may be termed, is the product of virus proceeding from a venereal sore; and usually occurs after the ulcerative stage of the sore has ceased, when absorption is busily resumed. But at any period bubo may occur, through exercise, debauchery in drink, or other folly on the part of the patient; occasioned them—if at an early period of the case—by mere extension of the inflammatory process; at a remote period, partly by this, and partly by evil working of the absorbed poison.

Bubo of the Penis is said to exist, when the lymphatics on the dorsum are continuously affected by inflammatory action; and when—usually about the middle of the organ—painful swelling takes place, with much induration; the inflammatory process having thrown out a large amount of plastic deposit, and threatening to advance to central suppuration. Pus generally forms; and may be at once evacuated externally, or may burrow extensively beneath the fascia. Treatment is by rest, leeching, and fomentation, in acute cases. Subacute swelling may be discussed by external application of the iodide of potassium in solution. When suppuration has taken place, early evacuation is practised; more especially if retention of urine have threatened to occur (p. 497.)

Inguinal Bubo affects the upper cluster of glands; and this is a prominent characteristic of venereal affection, in contradistinction to inguinal enlargement in consequence of common sores, or other source of simple irritation, on the thigh, leg, or toes; in which latter case, the swelling will be found beneath Poupart's ligament. The tumor may be small or great; chronic, subacute, or acute; indolent, or hastening to suppuration. The acute varieties, prone to suppurate, are those which follow directly on the primary sore; the chronic and indolent range themselves rather with the secondary and tertiary symptoms; the acute form often affects but one ganglion; the chronic frequently implicates the whole cluster; in suppuration of the acute, matter generally is first formed in the areolar tissue exterior to the gland; if the chronic slowly

come to matter, gradual softening and suppuration take place in the interior, and may originate at more points than one. To such swellings, the ordinary principles of surgery are applied; not always, however, with a satisfactory result. Were the acute bubo dependent on simple excitement, or on mere extension of a simple inflammatory process, it would doubtless often yield readily to rest, leeching, and fomentation. But such is not the case; leeching is found to have but little effect in retarding the onward progress; and this is to be explained, by the active presence of venereal virus within the part itself—just as antiphlogistics would have but little effect in retarding the formation of the primary pustule and sore. Loss of blood, therefore, may in most cases be abstained from; rest, fomentation, poultice, and antimonials are employed; and, when matter forms, this is evacuated. And perhaps it is well that suppuration and evacuation should occur; there being a tendency thereby towards elimination of virus. Should matter form only between the enlarged gland and the skin, it is advisable to insure suppuration of the former, by penetrating its interior by potass introduced through the external wound—after the acute stage is over; otherwise, the cure will be tedious and imperfect, and, obviously, little or nothing will be done towards elimination. Under subsequent poultice and water-dressing, the swelling may only partially subside; and in such circumstances discussion of the indolent tumor is to be obtained, by the application of pressure by means of a compress and bandage. Sometimes matter is secreted at different times, and in different sites; and, in consequence, sinuses are apt to form. Then a sufficient opening is afforded to each collection, and pressure is applied; if this fail, the sinuses are to be laid open by the bistoury. Very frequently, however, pressure, good diet, and the iodide of potassium internally, suffice. If, along with bubo, the primary sores still exist, it is obviously an indispensable duty to soothe these, and obtain cicatrization as soon as possible. An open bubo, attacked by sloughing or phagedæna, receives the ordinary treatment applicable to such a state.

The subacute bubo may be discussed; by rest, low diet, and external use of the iodide of potassium, followed by gradually increased pressure. Or, if this fail, a blister may be applied, in the hope of thereby either promoting resolution, or accelerating a satisfactory suppuration.

The indolent bubo may almost always be discussed; by pressure or blistering—the former usually preferable—rest, good diet, and internal use of the iodide. If an undoubted connection exist with the third class of sore, a powerful alterative is necessary; mercury, in moderate doses. If matter form, it does so slowly and imperfectly; and blistering may be useful in hastening the general disorganization of the swelling, which is then desirable. Often, to complete this, free use of potass is necessary; destroying undermined integument, and breaking up obstinate indurations of the glands.

Special modes of treatment have been thought advisable in venereal bubo; as, for example, by the local use of corrosive sublimate, and severe pressure. The preponderating weight of authority, however, would seem to be in favor of but little departure from the ordinary rules of simple surgery.

In taking a general view of the Venereal Disease, it is obviously resolvable into two great divisions: Local and Constitutional Pox.

I. *Local or Primary Syphilis.*—This consists of some variety of sore; sometimes of condyloma. It is transmissible to a second party, by contact and by inoculation; chiefly, if not only, during the ulcerative stage—in the case of a sore; and the earlier the secretion, the more impregnated is it, probably, with the virus. In treatment, an ectrotic result is to be obtained by timeous and decided use of an escharotic; which, converting all the poisoned textures into an instant slough, removes the disease—yet local and circumscribed; at the same time, probably, acting destructively, as a chemical, on the poison. Afterwards, management of the sore is simple; by medicated water-dressing.

If, however, the sore be not seen by the surgeon until it has attained an advanced stage, acutely inflamed, red, swollen, and very painful, perhaps with affection of lymphatics in the penis and groin, escharotics must be withheld. The inflammatory action is to be subdued by ordinary means; and, meanwhile, perhaps, something may be done towards decomposing and limiting the poison, by applying solutions of the chlorides.

When ectrotics fail, mercury is given, alteratively, in addition to the ordinary local treatment, in the third class of sore, and in obstinate samples of the second. During the local treatment of all cases in which ectrosis fails, it is well to stimulate the organs of excretion, by attending to the bowels, promoting the flow of urine by diluents and gentle diuretics, and determining to the skin. Antimony is most useful with this view; the object of such treatment being to favor elimination of the virus, by exaltation of ordinary means, in the hope that it may be excreted from the system as fast as it is conveyed thither by absorption from the primary affection, and that thus systemic zymosis may be prevented.

II. *Constitutional syphilis* consists of secondary and tertiary symptoms. 1. Those which follow speedily after the primary affection, within a few weeks or months, usually during the second month, consisting chiefly of general cutaneous eruption and affection of the throat, ushered in by febrile excitement, and, generally, by more or less change in the complexion, dryness of the hair, rheumatic pains in the ends of the long bones, and violent nervous headache, particularly in the forehead—aggravated at night, or rather by the recumbent posture.[1] 2. Those which occur more remotely, after six months or more have elapsed, and after the secondary train has already run its course; their most prominent and characteristic part being affections of the skeleton, of glands, and of the superficial areolar tissue.

It is generally supposed that constitutional syphilis, having once occurred, is not so likely to return, or at least in a severe form, in the same patient, after venereal contact or inoculation. And some even imagine that the system once affected obtains complete immunity from return of the disease, as in the case of smallpox. On this latter sup-

[1] Ricord, Lancet, No. 1284, p. 384.

position has been grounded an infamous proposal to inoculate as a preventive from syphilis;[1] a proposal only mentioned here for the purpose of characterizing it in words of disgust and indignation.

1. The *secondary* eruptions, which are seldom itchy like those of non-specific origin, are of different kinds. *Exanthematous*, roseola, following the simple sore, often at an early period. Not unfrequently it precedes the appearance of other forms of eruption, seeming to be the basis on which they subsequently form. *Papular*, lichen, the ordinary result of the first class of sore. *Pustular*, ecthyma, more frequently following the second class of sore than any other. *Tubercular*, prone to ulcerate untowardly, following the fourth class of sores. *Vesicular*, rare, large bullæ, surrounded by a copper-colored areola, becoming purulent, crusting, and tending to rupia prominens; sometimes following the second, but more frequently found after the fourth class of sore. *Scaly*, lepra, or psoriasis, usually the result of the third class of sore, true syphilis. Sometimes condylomata form, contemporaneously with the eruption.

Such is the general arrangement; but, in practice, occasional confusion of the sequences need not excite surprise. Very frequently, the hair loosens and comes away, threatening baldness. The throat is variously affected, by inflammatory process, aphthæ, or ulcer. Iritis not unfrequently occurs, and may follow any form of sore; it is more frequently found associated with the papular eruption, however, than with any other. Sometimes periostitis shows itself, on one or both shins.

A question here arises, are sores on the penis ever of a secondary character? No doubt they are. Eruptions degenerate into sores very frequently on the general surface, and there is no reason why the penis should be exempt from the general liability. Secondary sores there are known by their history, appearing at a long date after exposure to contagion. And they are also distinguished by absence of the ordinary characteristics of primary sores, usually superficial, inflamed, and of a peculiar hue, resembling aphthous ulceration of a mucous surface.

Secondary symptoms are shown, by experience, to be transmissible from father to child, from child to mother;[2] the blood being tainted with the virus, which has become multiplied by general zymosis; and the virus being communicated through the medium of tainted secretion. As yet, it is doubtful whether they are communicable by direct contact or inoculation.[3] It has still to be shown that the early, ichorous, non-purulent secretion of a secondary sore has not the power of propagating the disease.

[1] Brit. and For. Rev. Jan. 1850, p. 261.

[2] The husband procreates an infected child, which may then propagate the secondary poison to the mother. Where there are no children, the mother does not suffer.—Ricord, *Lancet*, No. 1284, p. 884. A mother affected with secondary syphilis, after primary sores in herself, however, may be expected to communicate the disease to her offspring. A father affected after conception has taken place, does not taint the child then in utero.

[3] Some maintain that the husband has the power of communicating syphilis, in the secondary form, to the wife, directly through the semen; and that then the female may produce an infected fœtus.—See *Whitehead on Hereditary Transmission*; and *Brit. and For. M. C. Rev.* April, 1852, p. 323.

In the papular form of eruption, and in many cases of the pustular, mercury is seldom necessary; in the tubercular, it is often hurtful. Antimony, sarsaparilla, guaiac, and the iodide of potassium are powerful enough alteratives and eliminators; and, along with attention to the general health, suffice for cure. In the scaly form, however, mercury is always given, yet warily, never pushed to extreme ptyalism; and always ceased from, at least for a time, on amendment being begun. In the constitutional symptoms following on the sloughing sore, the phagedænic sore, or the sloughing phagedæna, mercury is studiously abstained from, experience having amply demonstrated its inefficiency as a means of cure, and the certainty with which it tends to ultimate aggravation.

It is never our object to repress the eruption in its first onset; on the contrary, its full appearance is solicited. Obstinate persistence, and repeated recurrence, however, we seek to overcome. And the object of our constitutional treatment is, simply to assist nature in a full, early, and complete elimination of the poison; by acting on the skin, kidneys, bowels, and other organs of excretion.

The throat is steamed, fomented, touched with nitrate of silver, or blistered externally; according as it is the seat of active congestion, inflammation, ulcer, chronic inflammatory action, or passive congestion. Iritis has its own appropriate treatment, except when the sequel of the fourth class of primary disease; and then mercury is withheld, if possible—turpentine being substituted (p. 135). Coming baldness is anticipated, by shaving the head; and it is well to keep it closely shaved, for months, long after the other signs of constitutional disorder have wholly disappeared.

2. *Tertiary* symptoms seldom occur, except after the third and fourth classes of sores, and the worst examples of the second; unless when mercury has been profusely and rashly administered. In any case, they are seldom urgent, when the result of venereal poison alone. It is only when this has been associated in the system with the mercurial poison, that severity is declared. In the milder cases, the bones and periosteum are affected by a chronic inflammatory process; those suffering most which are most exposed. In the more severe cases, suppuration takes place; sometimes superficial, between the bone and periosteum; sometimes in the interior of the bone; sometimes involving the whole girth of the bone; and resulting in ulceration, caries, or necrosis. Sometimes the skeleton is affected symmetrically; corresponding bones suffering at corresponding points; but it may happen that the whole of one side is free, while scarcely a bone of the opposite side of the skeleton is not more or less affected. The joints are liable to pain, stiffness, and chronic enlargement; similar to chronic rheumatic affections of these parts. The skin is subject to be attacked—more especially after the fourth class of sores—by tubercular formations, which assume the characters of rupia prominens, and degenerate into foul irritable sores; sometimes the initiative is by vesicular formation; sometimes the sore at once is formed by sloughing, followed by acute ulceration. The mucous membrane of the alimentary canal is liable to suffer at either extremity, but especially in the fauces—by congestion, and troublesome ulceration, usually of a chronic yet intractable kind; the anus may be the seat of

aphthous ulceration, fissures, and condylomata. The tongue may become generally swollen; indurated at several points; at the edges and tip superficially ulcerated—the sores irritable and obstinate, sometimes spreading as if by chronic phagedæna; and the mucous surface of the cheeks and gums, as well as beneath the tongue, may be similarly affected. Chronic enlargement of the lymphatic glands on the upper and back part of the neck is common. Deafness is no unfrequent occurrence; probably from congestion of the mucous lining of the ear. Iritis and bubo sometimes occur in this class; the latter usually indolent; and the former tending less to severity than when a secondary symptom. The testicles not unfrequently undergo chronic and simple enlargement, with or without accumulation of serum in the tunica vaginalis.

Tertiary symptoms are not transmissible in any way.[1] Parents affected by them, however, impart scrofula to their children. Whatever their connection, mercury is generally superseded, in treatment, by the iodide of potassium; and this is assisted by attention to the general health—more especially as regards warm bathing, clothing, and regimen—and by other alteratives, if need be. In ostitic affections, obstinate, and attended with much nocturnal exacerbation, opiates are essential; and it may be that, ordinary means failing, we may be driven to small doses of corrosive sublimate. In obstinate affections of the skin and throat, too, the "liquor hydriodatis arsenici et hydrargyri" may be of service. And besides this constitutional management, the local affection of bones, joints, testicles, glands, are treated according to the general principles of surgery.

In tertiary symptoms following the fourth class of sores, the general rule still obtains as to the propriety of avoiding the use of mercury. There are cases, however, of occasional occurrence, which compel its exhibition. When the face or other part of the surface is covered with ulcerating tubercles, when the tonsils are ever and anon the seat of bad ulceration, and when the tongue and cheeks are affected with a constant succession of painful ulcers, surrounded by induration, and extremely slow to heal; when such symptoms have resisted the ordinary non-mercurial treatment, and the patient is obviously declining in health—in such cases, an alterative course of arsenic is sometimes of much service. But, if it fail, mercury is had recourse to; in combination with small doses of the iodide of potassium; and usually with the very best effect.

Iodide of potassium is of great use in the treatment of all venereal affections; as an eliminator, probably, of the virus, as well as an alterative of the system. It is best given in the form of solution; beginning with a dose of two or three grains, given thrice daily; and gradually increasing it to half a drachm, or more, according as it is borne. It is not always necessary to induce the physiological effects. Some have a strong prejudice in favor of eight grains thrice daily, in camphor mixture; and adhere to that dose, throughout the whole period of exhibition; seldom finding any decided intolerance manifested by the system.

[1] Whitehead and others are of a contrary opinion. See reference in foot-note, p. 539.

Again, if a primary sore is slow to change, and to assume the healing process, this medicine is useful; provided there be no inflammatory excitement in either part or system—for that provision is always essential to its proper administration. In many of the secondary symptoms, it supersedes the use of mercury in the chronic stage.[1] And, in tertiary symptoms of every kind and complication, it is pre-eminent and paramount. Sarsaparilla and guaiac, in the form of the compound decoction, are also not unimportant auxiliaries. Some affect to believe them quite inert; but we beg humbly to vouch for their possession of an important though minor virtue. In cases of intolerance of the iodide, by reason of idiosyncrasy, they often prove most valuable and efficient substitutes.

The Use of Mercury in Syphilis.

That mercury is a specific, indispensable as well as infallible, for the venereal disease in all forms, is a maxim which, happily for mankind, is fast falling into desuetude. It is now abundantly established that many forms of the disease, nay, the greater number of cases, are capable of cure without the use of this mineral; that, with simple means, that is, non-mercurial, the cure is shorter, the symptoms prove less grave, and immunity from future calamity—connected with the attack, its progress, or its mode of cure—is much more certain. In other words, the system is cleared quite effectually of the venereal poison, and it is saved from the pernicious effects of the mercurial poison, perhaps not the less formidable of the two. There are certain cases, however, in which it has been shown by experience, that a satisfactory issue cannot be obtained without recourse to mercury. And, in those cases, its judicious employment seldom leaves any deleterious impression on the system, there being then a decided tolerance of its administration (*Principles*, 3d Am. Ed. p. 169).

Its *modus operandi* is involved in uncertainty. Many, especially of the old school, still believe that it has a specific and destructive influence on the venereal virus; that the two poisons meet in the circulation, and that a destructive influence is exercised there by the mercury on its antagonist. This may in part be true, but it seems reasonable to conclude that its beneficial operation mainly depends, like that of other constitutional remedies, on its alterative influence on the general system, and on its power of stimulating secretion and excretion, so favoring elimination of what is noxious. Long ago, it seemed the general belief that such elimination was mainly to be achieved through the action of the salivary glands; that the poison, overcome in the blood, was to be excreted from it in the form of tainted saliva, and that the more speedily it was thrust out by the mouth, the more rapid and satisfactory would be the cure. Mercury, accordingly, was pushed invariably to

[1] As a general rule, the place of mercury is as an opponent of secondary symptoms, that of the iodide to deal with the tertiary. And practical observation would seem to warrant another broad statement; namely, that obstinate secondary symptoms, for which mercury has been given, are always benefited by iodide of potassium; while obstinate secondary symptoms, for which no mercury has been given, usually require mercury.

profuse salivation, either in the belief that such was necessary for satisfactory elimination, or holding that copious ptyalism was the only sure sign of the mineral having been so thoroughly introduced into the system as to afford a good prospect of the poison's annihilation. In the beginning of the sixteenth, and end of the fifteenth centuries, when the venereal disease experienced such an aggravation as to alarm all Europe, the antidote was plied with a blind, empirical, and desperate profusion, and there is no doubt that, to this circumstance, rather than to any unusual virulence in the disease itself, its frightful ravages at that period are to be attributed. The primary symptoms were bad, but the secondary and tertiary symptoms were far worse; under the last, the most frightful deformities and mutilations occurred, by affections of the bones of the face and cranium, and destruction of the soft parts of the nose, mouth, and throat, and death was no unfrequent termination of the hideous misery. Nowadays, we find no such severities, except when mercury has been heedlessly and unnecessarily given, perhaps in a strumous habit. And the undoubted rarity of mutilation, deformity, and death, by any part of the venereal disease, in the present day, is reasonably to be attributed to a greater prudence in the treatment of the affection, more especially in the primary symptoms. Mercury is withheld in many cases, if not in most; when administered, it is given in moderation, and with a reluctant hand, alteratively, not cumulatively, frequently stopping short of ptyalism, never going beyond mere touching of the gums. Formerly, the ordeal of salivation was such as must have proved to many frames quite intolerable. Even Boërhaave, in the eighteenth century, laid down the following "axioms:" "If there is four pounds of saliva spat every twenty-four hours, it is sufficient!" "the salivation is to be continued until the symptoms of the disease vanish, which generally takes up six-and-thirty days!!" and "a small dose of mercury must be taken for six-and-thirty days more, to keep up a gentle salivation!!!" No wonder that patients died, and no wonder that some were found to prefer death to such a mode of cure.[1] And yet, while in Europe suffering humanity was thus outraged by the profession, the natives in the West Indies, by the aid of guaiac alone, were showing an infinitely more favorable result. And among the former, too, there were not wanting some who became alive to the folly and danger of indiscriminate and extreme mercurialization—some driven to a better mode of reasoning and practice, by the stern rod of personal experience. Ulric de Hutten had himself been salivated eleven times, and thereafter became a zealous apostle of a treatment opposed to that of the majority of his fellow-practitioners.

But, while it is contended that mercury and the venereal disease are not inseparable—that a patient affected with the one is not inevitably to be affected by the other—it is yet to be admitted, gratefully, that this mineral is in not a few cases a most important remedial agent;

[1] Omnibus certe exulcerebantur fauces, lingua, et palatum; intumebant gingivae, dentes vacillabant, sputum per ora sine intermissione profluebat, unde et labia sic contacta ulcus trahebant, et intus buccæ vulnerabantur. Fœtebat omnis circa habitatio, atque adeo durum erat hoc curationis genus, ut perire morbo complures quam sic levari mallent.—*Ulric de Hutten*, 1519.

used, however, much more sparingly than in former times; and, in consequence, not only more efficient as a means of cure, but also less likely to peril the future durability and soundness of the frame. By reference to statistics, it has been found that mercury, indiscriminately given in all cases, does not accelerate, but that on the contrary it retards, the ordinary healing of primary sores; that it does not prevent secondary symptoms, but that these coming after its exhibition are generally severe; and that the tertiary symptoms are both most frequent and most severe, when mercury has been profusely given in the previous stages. On the other hand, an indiscriminate withholding of mercury, in all cases, will present a much less favorable general result, than when mercury is judiciously exhibited in those examples of the disease in which it is found by experience to be not only useful, but in a great measure absolutely necessary to full and satisfactory elimination of the poison.

If ectrotic treatment of the primary sore have been successfully achieved, of course no mercury will ever be required; there is no poison in the system, with which it is required to contend. But, failing this, it is given: 1. In the second class of primary sore, when it proves obstinate. 2. In the third class of primary sore, always. 3. In the papular and exanthematous secondary eruptions, only when they prove obstinate and recurrent. 4. In the pustular secondary eruption, if it prove obstinate; but not if it be consequent upon the fourth class of sore. 5. In the scaly secondary eruption, following the third class of sore, always. 6. In iritis, actively, unless when the affection results from the fourth class of sore. 7. In ostitic affections, of tertiary occurrence, when other means have failed to procure rest, alleviation of pain, and decadence of the constitutional irritation. 8. In tertiary affections of the skin and throat, of whatever origin, which have obstinately refused to yield otherwise. 9. Experience also shows it to be essential to the removal of that secondary taint of system, whereby a parent conveys syphilitic suffering to the child.

It is never given: 1. In any case, during acute inflammation in the primary sore; otherwise, ulcerative action will certainly sustain aggravation; and sloughing, or phagedæna, may be induced. 2. Nor in any case, during persistence of febrile excitement in the system; otherwise, cure will be delayed, and the symptoms aggravated. 3. Nor in any form of disease connected with the fourth class of sores—excepting the rare cases of a tertiary character already specified (p. 541)—otherwise, such aggravation is to be dreaded as will either end fatally, or fix the deleterious poisons permanently in the frame. 4. It is well to avoid mercury, also, if possible, whenever the active presence of scrofula is plainly and prominently indicated.

The mode of exhibition varies according to circumstances: 1. It may be given in the form of calomel and opium; in the ordinary way. 2. Or blue pill may be given, in such doses as the cure demands; combined with opium or hyoscyamus, if pain or purging be occasioned; if mere griping occur, it may be enough to let each dose follow closely on a meal. 3. Either of these forms disagreeing, hydrargyrum cum cretâ will probably be found suitable; and this is the preferable form for children. 4. The corrosive sublimate, in very small doses, in pill or

solution, is generally preferred in obstinate ostitic affections. And in such cases, also, it is sometimes of use to combine the mercurial with a tonic, or with small doses of the iodide of potassium. 5. In habits suspected of struma, the iodide of mercury is a suitable form; or a combination with iron may be given, in the "ferruginated" blue pill. 6. Inunction is useful, as an adjuvant to the internal exhibition, when speedy affection of the system is desirable; in iritis, for example, mercurial ointment is rubbed on the forehead and temple, while calomel and opium are given internally (p. 133). It is also used alone, in cases which exhibit intolerance of the remedy given internally, in any form; then it is rubbed in, night and morning, in the axillæ, or on the inside of the thighs. 7. Fumigation, also, is sometimes employed, when other forms seem to disagree. The fumes are obtained from the red sulphuret put on a heated iron; and they are applied to the system by inhalation; to a part, by means of an oiled-silk tube or bag. Fumigation, however, is seldom used, except in cases of obstinate chronic affection of the throat, and tertiary enlargements of the testicle.

In the primary affections, amendment often shows itself before the mineral has given any other evidence of having affected the system. In secondary affections, the yielding is seldom so rapid; such continuance is usually necessary as touches the gums; and then the remedy is no longer pushed; but a minor dosing is maintained; the object being not to increase, but simply to maintain, the approach to ptyalism, until decadence begin to appear satisfactorily. Then the remedy is altogether withdrawn; although, it may be, that persistence or recurrence of the symptoms may afterwards require its resumption. In tertiary symptoms, also, it is generally necessary to attain to the evidence of systemic seizure; maintaining this, if need be, with the same niggard caution and economy.

Certain idiosyncrasies require consideration, in regard to the exhibition of this medicine. 1. Some patients are slow to show ptyalism, even under great and sustained doses. In them, it is not necessary to push the medicine until ptyalism is produced. 2. Others have their mouths touched—perhaps severely—with but a few grains. And, in their case, the dosing must be both minute and guarded. 3. Some suffer by pain and purging, in whatever form the mercury is given internally. In these, careful inunction is to be made trial of. 4. Some are actually poisoned by the mineral; the condition termed *Erethismus* being induced.[1] To such patients mercury can never be given, in any form; for the symptoms induced are such as imminently to endanger life. The patient is anxious, under an apprehension of great and impending evil; his muscular system is prostrate; he trembles, walks with difficulty and uncertainty, and his heart's action is weak and fluttering; breathing is difficult; an unpleasant sensation of weight or tightness is felt at the præcordia; both mind and body are incapacitated for all exertion; and during some ordinary effort he may expire by syncope. Such symptoms require instant discontinuance of the mer-

[1] For Pearson's own description of Erethismus, see his work on *Lues Venerea*, 2d edit. p. 154.

cury, removal to a better and freer air, cautious use of stimuli, friction of the chest, generous diet, and avoidance of all exertion and excitement. 5. The system may not suffer, but the surface may; a very troublesome eruption occurring; vesicular, the *Eczema mercuriale*. This may be the result of either external or internal exhibition; when the former, it usually occurs in and around the part on which the ointment or plaster has been applied; when the latter, the first appearance is usually in the axillæ, or on the inside of the thighs, and thence the eruption may extend over the trunk. The vesicles soon break; and, instead of healing, are apt to degenerate into painful excoriations. Sometimes there is smart attendant constitutional disturbance. Treatment is by instant removal of the cause, and by exhibition of the soothing remedies which are suitable to such eruptions in general; the pain may be assuaged by opiate applications, the itching by an aqueous dilution of hydrocyanic acid. Liability to such an eruption does not forbid the use of mercury; but requires that it should be administered, when essential, in small doses, and with unusual caution. Its external use is certainly contraindicated. 6. Some systems evince their intolerance of the remedy, by gradual loss of flesh, strength, and spirits—an asthenic state, partly anemic and partly hectic, becoming established. In such circumstances, mercury is to be discontinued; generous diet, with iron or other tonics, is given; and cure of the venereal affection must be sought by other than mercurial means.

Violent salivation may be caused by imprudent and excessive dosing, and by sudden exposure to cold during use of the medicine; or it may depend on an idiosyncrasy of system. The mercury must be discontinued; diet should be low; cool and pure air is to be breathed; and the mouth is rinsed, and the throat gargled with weak brandy and water, or with solutions of the chlorides. If this prove insufficient, leeches may be applied over the angle of the jaw, followed by fomentation; so that a directly sedative effect on the salivary glands may be obtained. Chlorate of potass, given internally, has been found useful. After the febrile excitement has abated, diet is improved; and superficial ulcerations, in the mucous membrane of the mouth and throat, are touched occasionally with the nitrate of silver.

Of the remote evil consequences of mercury on the system, much might be said. Of itself, sakelessly given, it may cause the most obstinate and serious affections of the skeleton. Associated untowardly with the venereal poison, its evil results show themselves as tertiary symptoms —even at a very remote period—and may be most formidable: nodes, ulcer, caries, necrosis of bones; intractable ulcerations of throat, tongue, cheeks, and gums; exfoliation of the hard palate, and of the nasal bones; lupous ulceration of the nostrils, lip, or face; hideous deformity by loss of the nose and palate; caries of the skull, perhaps implicating the interior by perforation; ulcers and tubercular formations in the skin and areolar tissue; pain, misery, deformity, and death. Such calamities, happily, are now rare; but our museums can speak to their frequent occurrence in times not long bygone. The worst evils occur, when the mercurio-syphilitic cachexy is aggravated by association with the strumous. In treatment, we have not much in our power; and we

may well plume ourselves more on prevention than on cure. The iodide of potassium and sarsaparilla are perhaps the only remedies which deserve a special mention, as antagonists of this depraved state of system; the rest is done by general treatment and hygiene.

Syphilis in the Child.

A father, laboring under secondary syphilis, may transmit the taint to his child (p. 539). Or a mother, herself affected with secondary syphilis, may communicate the disease to the fœtus. Or a mother, laboring under genital sores, may give direct contagion to the child during parturition. Or the child may be infected, at a more remote period, by sucking a female possessed of secondary syphilis; the milk coming from tainted blood, and charged with the virus accordingly. Thus, in one or other, or in all of these ways, disease may be communicated at the earliest age. Sometimes the child is born laboring under the symptoms; more frequently, they show themselves after birth. The more prominent are—hoarseness of cry; a shrivelled, lean state of body; an anxious expression of face, often senile; chaps at the flexures of the limbs, and on the nates; a copper-colored eruption, sometimes studded with pustules, more frequently scaly; discharge from the nostrils; excoriation of the mouth and throat. When the mother is syphilitic at an early period of pregnancy, the child often does not arrive at maturity, but comes away dead and putrid, as an abortion; and this may happen repeatedly, until complete elimination of the poison from the parent's system has been obtained. For this purpose, a mercurial course is generally necessary—as can be readily understood, seeing that it is generally the true syphilis, or scaly eruption proceeding from the true chancre, which is communicated in this way. For a like reason, mercury is generally necessary in the child. It may be given indirectly through the nurse; or directly—as is to be preferred in most cases—by inunction, or by guarded doses of the hydrargyrum c. cretâ internally. Or mercurial ointment may be spread on flannel, and bound round the trunk, once a day, until the symptoms yield.

In nursing, precaution is necessary; as it is thought that a healthy nurse may have constitutional syphilis communicated in this way; the excoriated or ulcerated lips of the child producing a similar condition of the mammilla, and the ordinary class of secondary symptoms following. In such cases tubercles are apt to form about the anus and vulva of the nurse; and these may be the means of infecting her husband. It is possible, that in some cases the sores on the child's mouth may be primary, caused by lodgement of virus there during parturition—the unfortunate mother laboring under primary disease at the time.

Syphilis in the Female.

In the female, syphilis is peculiar only as regards the primary affections; and their peculiarity is chiefly as to their site; their general character, progress, and results, being very similar to the occurrences

in the male. Females are more subject to condylomata; and, if cleanliness be neglected, warts are very liable to form, sometimes attaining to large size, and involving the labia in hypertrophy. Sores are usually situated on the inner surface of the nymphæ, and in the orifice of the vagina; but they are also found in all parts of the vagina, on the os uteri, and sometimes in the urethral orifice; sometimes they affect the anus. Treatment is as in the male. Warty formations occasionally are of such size, as to require a regular dissection for removal of the hypertrophied mass (*Principles*, 3d Am. Ed. p. 386).

Pseudo-syphilis.

Certain diseases, not supposed to be of venereal origin, resemble some of the forms of constitutional syphilis more or less closely; the Radesyge in Norway; the Button-scurvy in Ireland; the Yaws in America; the Sibbens in Scotland—this, however, is lately supposed to be identical with the constitutional disorder consequent on condyloma (p. 534). These affections belong to the province of the physician.

Astruc, de Morbis Venereis, Venet. 1760. Hunter, John, A Treatise on the Venereal Disease, Lond. 1786. Bell, Benjamin, a Treatise on Gonorrhœa and Lues Venerea, Edin. 1793. Pearson, Observations on Various Articles in the Cure of Lues Venerea, Lond. 1807. Carmichael on the Symptoms and Distinctions of Venereal Diseases, Lond. 1818; *Ibid.* on Venereal Diseases, and the Uses and Abuses of Mercury in their Treatment, Lond. 1825. Devergie, Clinique de la Maladie Syphilitique, avec un Atlas colorié, Paris, 1826. Bacot, Treatise on Syphilis, &c. Lond. 1829. Travers, Observations on the Pathology of Venereal Affections, Lond. 1830. Lawrence on the Venereal Diseases of the Eye, Lond. 1830. Titley, Practical Treatise on Diseases of the Genitals of the Male, &c. Lond. 1831. Wallace, a Treatise on the Venereal Disease and its Varieties, Lond. 1833. Judd, a Practical Treatise on Urethritis and Syphilis, Lond. 1836. Colles, Practical Observations on the Venereal Diseases, and on the Use of Mercury, Lond. 1837. Ricord, Traité Pratique des Maladies Vénériennes, &c. Paris, 1838. Mayo on Syphilis, Lond. 1840. Acton, Treatise on Venereal Diseases, Lond. 1841. Guthrie on the Treatment of Syphilis without Mercury, Med.-Chir. Trans. vol. viii. Lane, Lectures in the Lancet, 1841 and 1842. Skey on Venereal Diseases, Lond. 1841. Cazenave and Schedel, on Diseases of the Skin, by Burgess, Lond. 1842. Parker, A Safe and Successful Method of Treating Secondary, Constitutional, and Confirmed Syphilis, &c. Lond. 1850. Whitehead on the Transmission, from Parent to Offspring, of some Forms of Disease, &c. Lond. 1851. Wilson, Erasmus, on Syphilis, Constitutional and Hereditary, Lond, 1852. [Ricord, Edition of J. Hunter on Syphilis, with Notes and Additions, Paris, 1852: Clinique Iconographique de l'Hôpital des Vénériens, Paris, 1851, Philad. 1852: Lettres sur la Syphilis, Paris, 1852, Philad. 1853. H. J. Johnson, Clinical Observations on the Diseases of the Genito-Urinary Organs—Part I. Gonorrhœa and its Consequences, Lond. 1851. J. C. Egan, Treatise on Syphilis, Dublin, 1853.—Ed.]

CHAPTER XXXIV.

AFFECTIONS OF THE URETHRA.

Stricture.

CONTRACTION of the urethra may depend on one of three different causes. 1. There may be *Spasm* of the muscles connected with the membranous portion of the urethra, causing temporary diminution of caliber at that part, as well as resistance to instruments attempted to be introduced; and there is good reason to believe that a similar result is sometimes occasioned, in the anterior portion of the urethra, by spasmodic action of the muscular fibres which have lately been shown to form part of the normal structure of the urethra, and to extend throughout its whole length—continuous posteriorly with the muscular coat of the bladder.[1] These conditions are liable to be suddenly induced, by ordinary exciting causes; and they generally disappear readily—often rapidly—under ordinary treatment; hip-bath, fomentation, opiate enema or suppository, perhaps a sedative by the mouth, rest, quietude, and antiphlogistic regimen. 2. *Inflammatory action*, by its attendant swelling, may cause contraction. It may affect the lining membrane itself; either at one point, as in consequence of injury; or over a considerable space, as in severe gonorrhœa—one of the symptoms of which, as we have seen, is an obvious diminution of the stream of urine, dependent on the contracted state of the canal. Or the inflammatory process may be exterior to the urethra; in the substance of the prostate, in the areolar tissue of the perineum, or by the side of the rectum; and the bulging of the phlegmon, or abscess, may not only diminish the caliber of the urethra, at the affected part, but may even shut it up altogether, causing retention of urine. The treatment of such a case has already been considered (p. 497); it is by antiphlogistics; withholding the catheter as long as possible, and using the bistoury for evacuation of matter at the earliest practicable period. 3. The canal may be narrowed by chronic structural change, occurring in the urethra itself; and this constitutes true *Stricture;* a condition which is ever liable to aggravation by the two preceding causes of contraction—spasm and inflammatory action. And it is well to limit the use of terms thus: understanding "spasmodic stricture" and "inflamed stricture" to be aggravations of true organic stricture in one or other of these ways; understanding the terms "spasm of the urethra" and "urethritis," to

[1] Hancock, Lancet, No. 1486, p. 187.

include the condition of temporary narrowing of the canal by spasm and the inflammatory process; and understanding by "stricture" an organic change in the urethra, causing a narrowing of the canal, which may be altogether independent both of spasm and of existing inflammatory action.

But stricture results from the inflammatory process, in and near the urethra; and this, as we have seen, may be excited in various ways. 1. It may follow the application of specific virus, as in gonorrhœa; and this is perhaps the most frequent cause of stricture. Clap is of common occurrence; the inflammatory process is often of long duration, as well as of such a kind as to favor plastic exudation; and treatment by injection is not unlikely to be so misconducted, as to cause maintenance or aggravation of such action. 2. Stricture may follow a chronic inflammatory process, always of a minor grade—never reaching beyond active congestion—occasioned by constant excitement of the canal; as by excess in venereal indulgence, or by an acrid state of the urine. The latter is no uncommon cause; the urine may be simply acid, in excess; or it may hold more or less deposit; the bladder is emptied frequently; and, on each occasion, the urethra smarts under the passage of the urine. At length, a continued state of congestion is induced; and that brings not only discharge from the free surface of the mucous membrane, but also a certain amount of plastic exudation which remains. 3. External injury may be the exciting cause; lighting up an active inflammatory process in and around the injured part, and tending much to solid deposit—not always easily removed by absorption. Hence, blows and kicks on the perineum are found to produce the worst forms of the affection. A less amount of violence, often repeated, may induce gradual formation of stricture; as by contusion of the perineum on the saddle, in dragoons, or others much employed on horseback. Also, there is good ground for fearing, that the disease not unfrequently originates in the unskilful and unnecessary use of bougies, lithontriptors, and other instruments. 4. Ulceration of the urethra cannot well heal, without causing more or less contraction of the canal; and this ulceration may be the product either of a common or of a specific inflammatory process. There is no more troublesome stricture than contraction of the orifice, in consequence of venereal ulceration there.

The proximate cause of stricture is plastic deposit, and consequent structural change, both in the substance of the lining membrane of the urethra, and also in the submucous areolar tissue; and it is important to remember, that it is in the latter situation chiefly that the deposit takes place. The ordinary sites of stricture are—at the orifice; at the neck of the glans, about an inch from the orifice; at the natural bend of the penis, from the suspensory ligament, between three and four inches from the orifice; and in front of the membranous portion of the urethra, between six and seven inches from the orifice.[1] The most frequent are the two last named. But it is seldom that a tight stricture is found at the posterior part of the urethra, without more or less con-

[1] The researches of Sir C. Bell, and others, have demonstrated that seldom, if ever, does contraction of the urethra occur posterior to the last-named site.

traction also at the ordinary sites in front; in other words, in cases of bad stricture, a plurality of contractions may generally be expected. When the affection results from external injury, the site obviously depends on the application of this.

The extent and degree of contraction vary. Sometimes a shred of plastic deposit passes across the canal; and this rare form is termed the *bridle-stricture.* Sometimes the stricture is tight, but very limited, seeming as if a thread had been tied tightly on the part. More frequently, the contraction is of greater extent, from a quarter of an inch to an inch; sometimes involving several inches of the canal. And the degree of contraction varies, according to the duration and treatment of the disease, from the slightest narrowing of the canal to its complete occlusion.

Behind the constricted point, dilatation takes place. Anteriorly to the actual stricture, there are collapse and contraction. The dilatation may be to such an extent as to hold more than one ounce of urine, and the mucous lining of the dilated part becomes prone to ulceration. Calculous matter may be retained there, and a stone may form, occupying the whole space. The mucous lining of the entire canal sympathizes more or less. From the strictured part, and also from the general surface of the membrane, an abnormal discharge proceeds, usually clear, sometimes puriform, and liable to be increased by casual excitement—this inducing aggravation of the congestion. Chronic prostatitis is apt to be induced, increasing the discharge. The lining membrane of the bladder becomes affected; the muscular coat, too, is changed, becoming hypertrophied; and, in consequence, both fasciculation and sacculation of the viscus may take place. The enlarged muscular fibres, arranged in fasciculi, act strongly on the urine; and the urine, not getting freely away through the strictured urethra, reacts on the mucous membrane, causing protrusion of this through the interspaces of the fasciculi. Cysts, thus formed, receive gradual additions to their parietes, and may attain to a large size, rivalling the bladder itself in magnitude. Chronic cystitis may follow. And morbid sympathy does not end with the bladder; the kidneys are in many cases involved; first in irritation, causing functional derangement only; afterwards in organic disease. The pelvis of the kidney and the ureters are often enormously dilated, their lining membrane furnishing much puriform discharge. The formation of stone, too, is favored, as was formerly remarked; derangement of the kidney's secretion leads to calculous deposit, and this is obstructed in its outward passage by the urethral change.

The symptoms of stricture are of gradual invasion, and may for some time escape the patient's notice. The urine is passed in an attenuated stream, sometimes twisted, sometimes scattered; the act is both frequent and tedious, and sometimes it is accompanied by pain and uneasiness in the bladder and penis, which abate on the bladder being emptied. After the patient supposes evacuation complete, a few drops, in some cases a considerable quantity, pass away involuntarily, coming from the dilatation behind the stricture. In consequence, the clothes are usually soiled and stained. The increased frequency of micturition is most observed at night. Discharge comes from the urethra, as already stated; and

excess in diet or exercise may induce aggravation, resembling an attack of gonorrhœa, and very probably implicating the bladder. Pain is complained of in the loins and thighs, and in the perineum; often erection is painful. In tight strictures, the urine may pass only *guttatim*; and then, too, there may be no escape of semen in emission—this fluid passing backwards into the bladder, to be afterwards discharged in an altered state along with the urine. The testicles are liable to enlargement; and the rectum frequently sympathizes, becoming prolapsed, or inflamed, or fissured, or ulcerated, or affected with hemorrhoids; sometimes strictures of the urethra and of the bowel are found to coexist. The straining, in bad cases, is such as to empty the rectum as readily as the bladder; and, in consequence, the water-closet has to be used, instead of the chamber-pot. Often hernia is induced. The prostate is liable to become not only excited but enlarged; and if this enlargement be chronic and simple, relief from the symptoms of stricture may be experienced; the prostatic tumor acting as a breakwater in favor of the part originally affected. But if ulceration or abscess affect the gland, then aggravation must necessarily ensue. As the kidneys suffer, their secretion becomes more and more changed; and the acrid urine, passing frequently along the urethra, reacts unfavorably on the urethral disease. The complications of ague and gout are by no means unfrequent in those advanced in years and who have lived freely. Retention of urine is at any time liable to occur; the degree of constriction being suddenly increased by spasm, or by inflammatory action, or by both. From this cause, extravasation of urine may follow; urinous abscess, however, ending probably in the formation of fistula in perinæo, is more common, generally producing mitigation of the symptoms, at least for a time, as will afterwards be explained. In severe and protracted cases, the general health suffers materially, independently of all accident; the flesh and strength fail, the digestive organs are impaired, the face is sallow, and the features wear an expression of anxiety almost pathognomonic of the disease. Constitutional irritation sets in; the symptoms denoting organic disease of the kidneys become more and more marked; purulent, mucous, ammoniacal urine passes often, in small quantities, and with much distress; febrile exacerbations recur with greater force and frequency; emaciation advances; the appetite and digestion fail more and more completely; at length coma may supervene, and the patient perishes.

Treatment is conducted on simple principles; but a satisfactory cure is often of very difficult attainment. Our object plainly is, to get rid of the redundant deposit which causes the contraction; and this may be effected in one of two ways: 1. By simply procuring absorption, under the stimulus of pressure. 2. By so managing the application of pressure, as to establish a temporary and active congestion in the part, which, on its resolution, may induce rapid diminution of the deposit—somewhat in the same way as the injection of a hydrocele removes a redundancy of serum (*Principles*, 3d Am. Ed. p. 190). Advance of such action to a high grade is obviously to be avoided; true inflammation will cause farther deposit around; and ulceration—at the time perhaps widening the canal—is likely ultimately to lead to renewed and

probably aggravated contraction, by puckering of the cicatrix. Besides, ulceration, to prove effectual on the submucous deposit—the true cause of the stricture—must first penetrate and destroy the mucous membrane; an event never desirable. 3. In bad cases, the knife may be necessary to free the contracted part; not, however, as a sole means of cure; but to assist the bougie in afterwards establishing the normal condition of the part.

To obtain the curative result, in ordinary cases, cautious management of the metallic bougie is now universally acknowledged to be the most suitable means. But, in the first instance, exploration is necessary; to ascertain whether a stricture exists or not, as also its nature and extent. A metallic instrument may be used for this purpose; but one of wax is sometimes preferred, as less formidable to the patient, and capable of conveying very explicit information as to the state of the urethra. A large one is not suitable obviously; neither is one of small size—for it is liable to catch a lacuna, and so to indicate stricture when there is none; or, passing through a stricture of no great tightness, it may lead to the belief that the canal is clear, while contraction really does exist. One of a medium size is selected; and, having been warmed gently, and made pliable, by the hand, is introduced cautiously. If obstructed, it is gently withdrawn a little, and then pushed on again; a fold of the urethra may have been in the way. If, however, still opposed, the existence of stricture may be fairly presumed; and its site is noted, by observing the extent to which the instrument has passed. To elicit farther information, the bougie is pushed steadily onwards, so as to fix its point in the stricture; and, on withdrawing it, a tolerably accurate idea may sometimes be obtained of the extent and character of the contraction, by observing the marking of the instrument's point. The wax bougie is then laid aside; its office is exploration;[1] and now, for the cure, one of metal is taken up, of such a size as is likely to pass without much difficulty. The most convenient kind of bougie is that manufactured of Berlin silver; hollow, and consequently light, yet firm enough; and always possessing a smooth surface. The curve should be gradual and slight—a segment of a large circle; and the set of instruments are arranged in a gradually ascending scale, from the smallest wire-like form, to what is likely to fill the average canal in its normal state. The selected instrument, oiled, or smeared with cold cream—sad mischief has happened from croton oil having been mistaken for the bland fluid—is passed down to the seat of stricture, and steadily pressed onward, with intent to pass through it. Having succeeded in this, the instrument is permitted to remain, from a minute to half an hour, according as the patient's feelings may indicate. If sickness occur; or if much pain be felt, and on the increase; or if the patient express a decided wish for removal of the instrument, stating his belief that it is "hurting" him—it should be withdrawn; remembering that our object is, to excite not inflammation, but absorption only. Rest and temper-

[1] Many surgeons never use the wax bougie, even for exploration. No doubt, the metallic instrument is quite capable of fulfilling all ordinary indications in this way. But if a wax instrument is to be used at all, this seems its proper place.

ance are essential, for that day. On the second or third day, we expect the uneasiness occasioned by the former introduction to have passed away; and the operation is repeated; introducing the same instrument as before, then immediately withdrawing it, and substituting a size larger. And this is repeated, at longer or shorter intervals, until the full size is passed readily. This last is repeatedly introduced at the ordinary intervals, until all obstruction has fairly disappeared; and then the stricture may be regarded as cured—though not finally disposed of. A tendency to recontraction remains. And, to obviate this, an occasional bougie is required—sometimes termed the *protesting* bougie—at a gradually increasing interval; the first introduction taking place at the end of a fortnight, then after a month, then after two months, and so on; until, after introduction at an interval of six months, all is found normal. Thus only can immunity from relapse be secured.

Such is the ordinary course of events, in a plain and simple case; but many circumstances require attention besides. And, in the first place, in commencing the treatment of stricture, it is essential to have regard to the general health, and especially to the state of the urine. If an acrid fluid be frequently passing over the canal, little or no progress can possibly be made; the disease need not be expected to give way, while a cause of maintenance, if not of origin, is in constant operation. It is also very important that regimen should be strictly regulated; and that walking exercise should be indulged in as little as possible. Horseback exercise must be absolutely prohibited.

The instrument is held lightly in the hand, and is never pressed onwards with much force. Force of propulsion, and tightness of grasp, may tear the urethra, pushing the unentered stricture before the instrument's point—if this be kept straight; or, if any divergence be made from the true direction of the canal, the parietes are perforated, and a false passage is established. Lightness of grasp, and gentleness of propulsion, permit the instrument to be restrained by the walls of the urethra; and all such hazards are avoided. The point is pressed steadily on the stricture for a short time; and then, withdrawing the hand, we observe whether the instrument resiles, or remains fixed in its place; if the former event occur, it is a sign that no penetration of the stricture has taken place; the latter is a token of the instrument's point being lodged in the contracted part. And according to the evidence thus afforded, either a smaller instrument is selected, or the onward pressure is steadily maintained. In the latter case, our chief care is to avoid the use of force, and to exert the steadily maintained pressure not on the sides of the canal, but on the obstruction in its direct course; and, to assist in this, when the stricture is behind the scrotum, the forefinger in the rectum is often of use.

An obstacle may be felt at the bougie's point, near the neck of the bladder; and yet it may not depend on stricture. The canal may be of its normal caliber throughout; but made tortuous, by unequal enlargement of the lobes of the prostate. In such a case, a flexible instrument is more likely to pass than one of metal; the passage is to be traversed, not forced—"arte, non vi"—and much assistance is derived

from the finger in ano. Another obstacle, not connected with stricture, may be occasioned by osseous deposit on the rami of the ossa pubis, or upon their symphysis; the result of injury, or of idiopathic ostitis. It is of rare occurrence. A cautious turning of the instrument's point to a side, will probably elude such obstruction.

A stricture, at first wholly resistful of the instrument's point, may in a short time yield to it. Instead of attempting at once to penetrate, therefore, steady pressure is kept up; and, after a few minutes, we may expect such an amount of relaxation to take place as may admit either of the instrument passing completely, or of its becoming lodged in the strictured part.

It is not essential to the cure, that penetration should be complete at first; and this undoubted fact has an obvious and important bearing on practice. Having found a tight and unyielding stricture, which will not, without force, permit penetration, even by a very small instrument; and if there be no threatening of retention, or other urgency; we lay aside small bougies, and the determination to penetrate, and, selecting an instrument of medium size, pass it down to the stricture, and retain it there—on the stricture, rather than in it—as long as the patient's feelings will allow. This is repeated, at the usual intervals. And, after several such introductions, relaxation will be found gradually advancing, so as to admit first of partial lodgement, and afterwards of complete penetration. No time is lost; and no risk is incurred. The principle of cure is obviously the same as that of the ordinary use of the instrument.[1]

Should, at any time, over-excitement—as evidenced by tendency to bleeding, pain, spasm, and discharge—occur in the part, from over-use of the bougie, exposure to wet, fatigue, intemperance—all instrumentation must be desisted from, for a time; until, by rest, and antiphlogistic regimen, a quiet and tractable condition of the canal has been restored.

In receiving the bougie, the patient may be either erect or recumbent. If it be its first experience of such an operation, the latter posture is preferred; lest faintness occur, as is apt to be the case. After one or more repetitions, such tendency ceases; and then the erect posture is more convenient for both parties. The surgeon, seated in front, passes the instrument with its convexity directed towards the abdomen, down to the suspensory ligament; and then, gently depressing the handle, while the instrument is slowly turned half round, this natural obstruction is overpassed. To avoid injury to the canal here, it is well to move the point mainly on the upper surface of the urethra. If an opposite course be followed, a fold of the membrane is almost certain to be caught; then rash pressure cannot fail to cause abnormal penetration—and a *False Passage* is begun.

The evidences of a false passage being formed are: the consciousness of having used an unusual and unwarrantable degree of force; an un-

[1] To this mode of procedure the term "tunnelling" has sometimes been applied; portion after portion of the stricture being excavated, as it were, until a clear "driftway" has been established. I can vouch for its safety and efficiency.

certainty as to the point having been in the true direction; a want of the ordinary sensation of being grasped, as the pressure is continued; a sensation of something having suddenly yielded; when pressure is then continued, a feeling of roughness and rubbing on the instrument's point—and the bougie is then apt to advance, not smoothly, but per saltum; a complaint from the patient of unusual pain—perhaps with a start, and then faintness ensuing; blood welling out, in greater or less quantity, by the side of the instrument. Very frequently, the patient decidedly corroborates our own apprehensions, by declaring his conviction that the normal canal has been departed from.

Such things ought not to be; the risk is great. And they need not be; for, by avoidance of force, and by the exercise of ordinary caution and skill, all such accidents are rendered more than unlikely. The only circumstances in which force is at all excusable, are those of urgent retention. Then the bladder must be relieved, as we have seen (p. 496). But, of all the methods of affording relief, forcing the stricture is probably the worst. If there be time and indication, leeches, fomentation, hot-bath, sedatives, and antispasmodics are tried; and failing these the obstruction is overcome by incision.

The risks of false passage are: 1. Escape of urine, and consequent sloughing or abscess, according to the extent and manner of the infiltration. If the false passage be incomplete, opening into the urethra only on the distal side, urine does not enter so readily as when the perforation is complete—having both a distal and a proximal opening. The incomplete form, consequently, is more likely to cause urinous abscess; the complete—urinary infiltration. 2. Hemorrhage may be considerable. 3. Inflammatory action may seriously affect the part, causing softening and ulceration; and healing cannot take place without contraction—worse probably, than the original stricture. And, besides, during the persistence of inflammatory action, constitutional disturbance is likely to be severe, bearing hard on a system already enfeebled. 4. Or, in the especially feeble, a formidable amount of constitutional irritation may occur, irrespective of local inflammation.

A false passage having been formed, it is with difficulty avoided in subsequent introductions of the instrument. For some days, nothing should be passed along the canal; an opportunity being thus afforded for closure of the track; or, at least, for such diminution of it as may render entanglement of the instrument less likely. And when this is again used, it must be with a very lively caution; the hand being alert, as it were, to notice the first and slightest deviation from the normal path.

In some patients, there is an especial irritability, which tends to baulk the bougie; perineal spasm supervening on the introduction being attempted, and receiving obstructive aid, probably, from a turgescent state of the lining membrane. Such a difficulty may be partially or altogether avoided, by the exhibition of a moderate opiate, by the rectum or mouth, about half an hour before the attempt at introduction—or by the employment of anæsthesia. Other patients are liable to suffer from agueish attacks, after use of the bougie. Such are generally elderly

persons, who have lived freely and been abroad. They benefit greatly by the use of quinia.

Hitherto, we have been speaking only of the ordinary cases which require the ordinary application of instruments, in expectation of the ordinary result—disappearance of the redundant deposit, by absorption; this absorption being excited, simply and directly, by pressure. We now come to another class of cases, requiring another effect of the instrument—the second which we formerly noticed; excitement of an active congestion, whose resolution may carry with it removal of not only its own effusion, and exudation, but also of the deposit of former times. These are tight and unyielding strictures, of considerable extent, and long duration. A very small instrument may be insinuated into or through them; but no progress is made; on each introduction, there is the same difficulty to be overcome. In such cases, the treatment requires a modification; a higher result is to be obtained from the instrument's use. A firm silver catheter is carefully passed through the stricture; and is retained by tapes, which are appended to the rings of the instrument, and secured, like the lithotomy tube, to a bandage round the waist. The orifice of the instrument is shut by a plug of wood or cork, which is to be removed, from time to time, for evacuation of the urine. At first, the catheter is felt tightly fixed; and, after some time, the embrace is found to become more and more close, in consequence of the crescent inflammatory process, and its attendant swelling. The foreign body's presence is resented, in the usual way; and an effort is made for its extrusion. The temporary lodgement of a smooth metallic substance in an open mucous canal, however, does not inevitably cause true inflammation; and, accordingly, the action is generally found to fall short of this, and to follow the ordinary course of acute congestion—resolving itself by copious discharge. This occurring, relaxation and widening of the canal take place; absorption, and exhalation on the free surface, both busily conducing to this desired result; and then the instrument—before, fixed and firm as in a vice—will be found loose and movable. It is now withdrawn; and a bougie, of comparatively large dimensions, may be passed in its stead. This is permitted but a brief stay; and then the ordinary instrumentation is proceeded with, as in other cases.

This method of treatment, it is obvious, requires great care; there being always a risk of overaction locally, as well as of untoward constitutional disturbance. And the case must be watched accordingly. There is always considerable uneasiness in the part, during the instrument's stay; and some excitement of the system may seldom be avoided. It is only when either proceeds to excess, that the instrument has to be prematurely withdrawn. In some patients, it may be safely retained for twenty, thirty, or forty hours; in others, that time must be greatly abridged. Opiates are of service, in allaying the pain and irritation. And if by their use, all untoward symptoms are averted, we need not regulate the catheter's stay by any fixed limit of hours; but may regard its thorough loosening, as the first sign of the propriety of its removal. It is seldom, however, that a retention of more than twenty-four hours is required. And, in that short space of time, if the case proceed

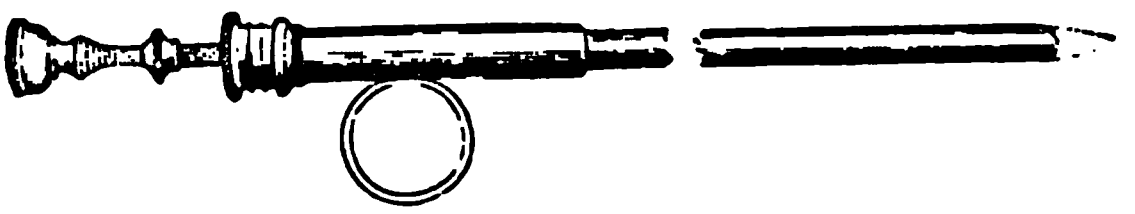
favorably, we may expect threefold more progress than under the ordinary system of management. This method, however, though rapid, is doubtless attended with some risk, which the other method wants; and therefore is wisely held applicable only to the severer forms of stricture on which ordinary means may have produced, or are likely to produce, but little effect.

But there are worse strictures still, to which even this treatment is unsuitable—because of their extreme tightness, and unyielding nature. An instrument cannot be made to penetrate; and it is difficult permanently to retain one but partially introduced. In these cases, we must be content with the treatment already noticed, of passing down a bougie, of medium size, at the ordinary intervals, and retaining it in contact with the stricture for some time; expecting that, in this way, the desired diminution of deposit by absorption may advance. But, if excitement occur, the case becomes urgent by retention of urine; and then we are forced to relieve the bladder. The stricture must be got through. A firm instrument, of suitable size, is patiently and gently used—remembering that, by the inflammatory process, the parts have had their lacerability much increased. With the aid of sedatives and antispasmodics, we may succeed. But, if baffled in this legitimate use of the instrument, we are not warranted in having recourse to force. It is better to cut than to bruise and tear; it is better to make a clean wound through which urine may discharge itself innocuously, than to leave a bruised and torn sinus in which infiltration can hardly fail to occur, with all its lamentable results. The patient, under chloroform, is put into the position suitable for lithotomy; and an incision is made in the central raphé, as formerly described (p. 500). The bladder having been relieved, and the stricture cut through, a catheter of medium size is passed from the orifice of the urethra to beyond the seat of stricture, and is retained as long as the feelings of the patient will permit. Then it is removed; but on excitement having passed off, it is reintroduced; and thus we endeavor to retain the canal of considerable width, while the external wound slowly closes. On cicatrization being nearly completed, the size of the catheter or bougie is gradually increased; and instrumentation is continued, in the ordinary way, until full dilatation shall have been completed. This is the treatment of extreme cases—complicated with the crisis of retention. To such only is it applicable. And of the skilful surgeon it is comparatively seldom required.

It has lately been proposed to extend the principle of subcutaneous incision to the treatment of stricture. But a fatal objection to such proceedings is the liability to urinous infiltration; free and direct incision coming soon to be required, and that too late to save the part from loss of substance, and the system from grave disorder. Accordingly, it is understood that the practical experience of this method has proved far from satisfactory; and, in all probability, farther repetition of the experiment will scarcely be thought advisable. The risk is least, when fistula in perineo exists behind the stricture; and when, consequently, the urine has an opportunity of draining away through the perineal opening, without coming in contact with the incised urethra situate anteriorly.

A safer method of incision is from within the canal, by the employment of lancetted catheters. But these are dangerous weapons, very obviously, in the hands of the inexperienced; and the most skilful must have difficulty in using them with safety, in the case of stricture posterior to the scrotum. There can be no certainty of the incision being made in the true direction; the walls of the canal may be injured; and then infiltration of urine can hardly fail to ensue. For very tight and unyielding contractions anterior to the suspensory ligament, however, the method is not unsuitable. The straight instrument of Mr. Stafford can be passed down, and held directly on the diseased part; and the operator can make sure of pushing onwards the cutting stylet in the right direction. After this, a common bougie may find itself but little

[Fig. 233.]



[Mr. Stafford's straight Lancet-Catheter: the lancet point marked by the dotted lines. (From Fergusson.)—Ed.]

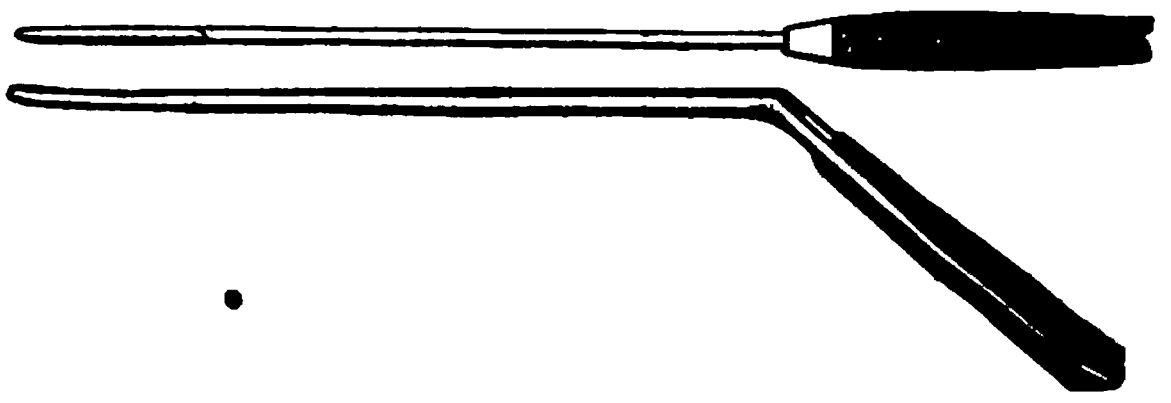
opposed, and may pass readily on to the bladder. But even then there is always some risk of accident by escape of urine into the cut parts. And, accordingly, we would limit the use of the straight and short cutting catheter, to those cases of anterior stricture which resist the ordinary means; and would dissuade from the use of the long and curved cutting catheter, under any circumstances whatever. It is but seldom that even the former will be required.

Orificial stricture—tight, callous, unyielding, sometimes admitting the most delicate probe with difficulty—is usually the result of cicatrization; and the sore has probably been of venereal origin. By probes, or short bougies, occasionally introduced, a cure by dilatation may sometimes be procured in the ordinary way. But, very frequently, it is found necessary to expedite the process by incision. A narrow probe-pointed bistoury is introduced; and, by its edge, the contracted part is notched all round. A bougie is passed immediately afterwards, of such a size as will penetrate without force. And repetition is made daily, in an ascending scale; a less interval than usual sufficing here, in consequence of there being less irritability than in the deeper-seated portions of the canal. Sometimes, it may be found necessary to lay the contracted part entirely open by incision, introducing the bougie afterwards through the wound; and seeking for a cure of the stricture, at the cost of establishing an imperfect state of the urethra, similar to the congenital malformation termed Hypospadias.

[Mr. Fergusson, having been much pleased with the result of incision of the stricture, when within an inch or two of the orifice of the urethra, has devised a simple instrument for incising or scarifying strictures farther from the orifice than a bistoury can well reach. The instrument is illustrated by the accompanying figure. It consists of a long slender staff in the groove of which a stylet, at the end of a long and delicate

stalk, is made to play. The staff is first introduced down to the stricture or within it, and the cutting instrument is then slid along the groove; the stricture may be divided by a single incision at the lower

[Fig. 234.]



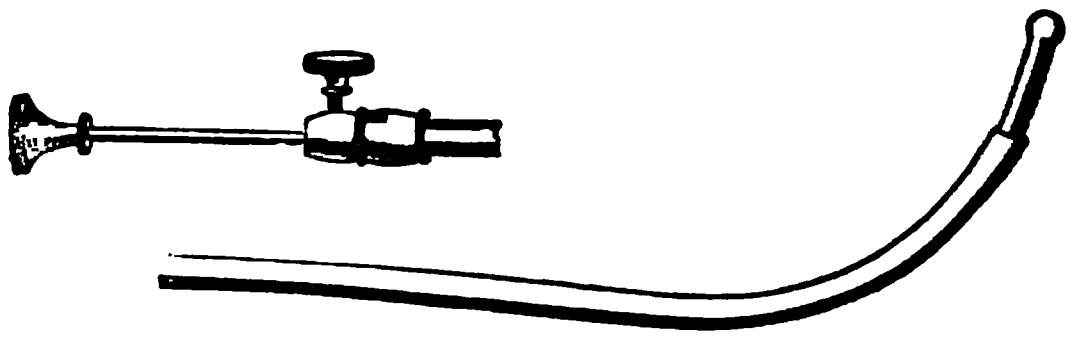
[Mr. Fergusson's Instrument for incising Stricture of the Urethra. (From Fergusson.)—Ed.]

wall of the tube, or several notches or scarifications may be made. Mr. Fergusson recommends the instrument and the plan of treatment highly, when the stricture is in the anterior part of the urethra.—Ed.]

It is easy to understand how spontaneous alleviation of stricture may occur; either by absorption, or by ulceration. But it is probable that such an occurrence is actually very rare; and, certainly, it is not to be trusted to in practice. Relief by the latter mode, indeed, is scarcely desirable; inasmuch as the cicatrix of the ulcer is likely to reproduce contraction, perhaps in an aggravated form.

For a like reason, the caustic bougie has fallen into comparative desuetude. To prove successful as an escharotic, in clearing away obstruction, the mucous membrane must first be sacrificed; and though, for a time, ample space may be thus obtained, yet in the end recontraction is obviously inevitable; partly by reason of the plastic deposit which surrounds ulceration, and partly by reason of the contraction which invariably attends on cicatrization of a sore—unless, indeed, reproduction of the urethra's wall, by new tissue, be considered possible, during the cure. The best use of the "caustic bougie" is, not as an escharotic, but as a corrector of irritability. If a peculiarly irritable stricture resist the ordinary means, already alluded to, decided benefit may be

[Fig. 235.]



[Lallemand's Urethra Porte-caustic. The caustic is contained in the cup, which is shown projecting from the end of the instrument; it is attached to the stylet represented at the other end. (From Fergusson.)—Ed.]

obtained by the application of nitrate of silver to the contracted part and its vicinity. This may be accomplished, either by the porte-caustique, recommended by M. Lallemand, or by means of the old-fashioned instrument—a wax bougie, in whose hollowed point a portion of

the nitrate is imbedded. For a stricture at all penetrable, the former is the preferable instrument; but a tight contraction can be directly reached, only by the latter mode of conveyance.

Instead of nitrate of silver, caustic potass is used by some; not as an escharotic, but as an "alterative."[1] A small portion—from a grain to the eighth of a grain—having been inserted in a hole made in the point of a soft bougie, is passed rapidly down to the stricture, and held there for one, two, or three minutes; and repetition is made in four or five days, after irritation has passed away.

It is probable that what are termed "elastic" strictures—strictures which dilate under the ordinary treatment, but speedily relapse, and become tight as before—often depend on an unusual irritability of the canal; and that they will be more appropriately treated by the occasional application of nitrate of silver—in conjunction with the ordinary use of the bougie, and suitable general treatment—than by the employment of cutting instruments.

Lately another mode of external incision has been adopted;[2] namely, passing a small grooved staff through the stricture, and cutting into the groove at the contracted part, by perineal wound. To avoid hemorrhage, the incision is placed carefully in the perineal raphé; and on withdrawing the staff, a catheter is introduced and retained as after the old operation. Until this is done, it is well to have the patient deep in anæsthesia, with a view to avoid urinary infiltration by voluntary action of the bladder. By subsequent use of the bougie, in the ordinary way, permanent as well as rapid dilatation of the canal may in many cases be obtained.

The advantages of this procedure are, accuracy of division, and rapid approach to cure. The disadvantages are, the ordinary risks of such operative procedure, and the uncertainty of being able in all cases to insinuate (not force) a small instrument through the contracted part. Some few strictures, we believe, are really "impenetrable;" and are consequently to be treated ordinarily by the "tunnelling method" (p. 555)—in the crisis of retention by perineal incision according to the old way (p. 500). The great majority of "penetrable" strictures, on the other hand, are capable of safe and satisfactory cure, without the use of cutting instruments. But to some few of those which refuse to yield to ordinary treatment, and in whom great irritability of system prevails, this mode of operation seems very suitable—an operation whose proper character will probably be fixed hereafter, as neither so safe nor so generally applicable as its promoter at first imagined, nor yet so dangerous or disappointing as some of its opponents have declared.[3]

Another mode of treating obstinate stricture—recently devised—is by tubular dilatation; introducing a small bougie or director through the stricture, and, on that passing down, tubes of increasing size; the object of the apparatus being to secure accurate introduction and rapid dilatation.[4] Time is yet wanting to warrant a decided opinion of the

[1] Wade on Stricture, Lond. 1849.
[2] Syme on Treatment of Stricture by Perineal Incision, Edin. 1849.
[3] Lancet, March 22, 1851.
[4] Wakley, Lancet, No. 1488, March, 1851; *ibid.* No. 1484, p. 144.

merits of this proposal; but facts, as far as they go, speak in its favor, as being both suitable and safe.

Urinous Abscess.

This consists in the condition of abscess, complicated with a communication with the bladder or urethra, and consequently having a greater or less admixture of urine in its contents. The formation may occur in one of two ways; from without or from within. 1. An abscess may form exteriorly to the urinary passages—excited by injury, or by the irritation of stricture or stone; and, in its progress by enlargement, it may open into the urethra, or bladder—according to its site. Then, through the ulcerated aperture, urine enters. Its stimulus, within the purulent cyst, necessarily kindles a fresh amount of inflammatory action. If this advance rapidly to ulceration of the tissues composing the limits of the original abscess, urinous infiltration takes place, with sloughing of the affected parts. But if the pyogenic membrane remain entire—perhaps strengthened by a renewed and plastic exudation—then the escaped urine remains limited within the suppurated space, and the state of urinous abscess is established. The collection may assume quite a chronic character; but, in general, it extends more rapidly than an ordinary acute abscess, hastening to the surface, and discharging thin, dark-colored, and fetid contents.

2. Or, as more frequently happens, the affection originates in ulceration of the lining membrane of the urethra or bladder. Acute ulceration, and also direct laceration, of the mucous membrane is liable to occur, as we have seen in the case of retention of urine (p. 496); then rapid escape of that fluid takes place, under powerful action of the hypertrophied muscle of the bladder; and the most formidable extravasation results. But, unconnected with any such crisis, a more gradual giving way may take place; the urine, escaping first in a few drops, may excite an inflammatory process of a sthenic type; the abscess formed has all the ordinary characters—the important limiting barrier of plastic exudation not excepted: and, as it enlarges, these are not destroyed. Before the actual ulceration, too, it is probable that an inflammatory process has been slowly advancing in the tissue exterior; which has thus become in some measure consolidated, before any urine has had an opportunity of entrance.

Or, as has already been stated, the commencement may not be by ulceration, but by wound or tear—inflicted by an unskilful use of catheters, bougies, or other instruments (p. 556).

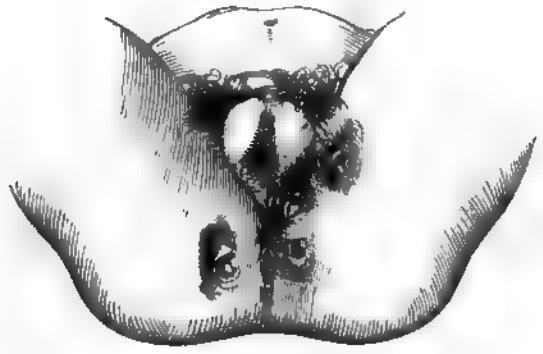
But the term "Urinous, or Urinary Abscess," is generally understood to refer to the urethra. Its origin is commonly from within; and the usual exciting cause is stricture. The urethral ulceration may be either immediately behind the stricture, or at some distance posteriorly. The ordinary site is in the perineum. There a hard swelling is discovered, on pressure; the ordinary symptoms of stricture undergo aggravation; shivering and febrile disturbance occur; and, perhaps, by the pressure of the abscess, retention of urine may be occasioned. Treatment consists in making a free external incision, for the evacuation of

matter and urine; afterwards removing the cause, the stricture, in the ordinary way.

Urinary Fistula.

This may follow wound in the perineum, implicating the urethra. More frequently, it is the result of urinous abscess. The collection has opened spontaneously in the perineum, temporarily relieving the symptoms, both of abscess and of stricture; but, by persistence of the latter, closure and cicatrization of the abscess are prevented; the irritation of the stricture maintains a morbid degree of excitement, and the obstruction which it occasions forces the urine into the abnormal channel. The abscess consequently does not close; but partially contracting,

Fig. 286.



Example of Fistula in perineo.

degenerates into the condition of fistula. There may be but one fistula, or several; in the perineum, or traversing the scrotum, or anterior to the scrotum, or on the nates. Sometimes abscess burrows beneath the fascia of the penis, and opens near the glans; sometimes the opening is on the dorsum of the penis. Also, one abscess, having more than one external outlet, may lead to the establishment of more than one fistula; or, each fistula may be connected with a separate abscess. The discharge is thin and gleety; often copious. Sometimes a constant dribbling of urine exists; in other cases, urine escapes only during an expulsive effort. The surrounding parts are tender and excoriated; the patient is in a constant state of discomfort; and very frequently his general health suffers seriously.

Treatment is simple; directed to the stricture, not to the fistula—at least in the first instance. The stricture having been thoroughly dilated, the urine comes again by the normal channel; the fistula contracts and dries; and, in many cases, it wholly closes, without any direct treatment having been received. Should contraction prove tedious and incomplete, the hot wire may be used; applied not to the mere orifice, but deep in the track—lest premature closure of the external part might take place; not repeated frequently, but at long intervals—it being our

object to obtain the benefit of the healing process which follows remotely on the burn, not the destructive and inflammatory effects which are its primary result (p. 189). If sinuses communicate with fistulæ, it will probably be necessary to lay them open with the bistoury. In cases long neglected, in which the whole urine has for years been passing by the perineum, the urethra anterior to the opening contracts greatly, and may be almost completely obliterated. Dilatation is then effected with great difficulty; and recourse to the method by incision will probably be expedient.

Sometimes the abscess opens, not in the perineum, but into the rectum; and fistula forms in the bowel. Urine passes per anum, and air, or even feces, may escape by the urethra. Treatment is the same as for the more common varieties; the speculum ani being used to protect the bowel, when it is necessary to employ the cautery.

Laceration of the Urethra.

This has been already spoken of (p. 498). The first object is to prevent infiltration of urine; and that can be accomplished only by early introduction of the catheter, which should be retained until a sufficient time for consolidation of the injured parts has transpired. If a catheter cannot be passed, incision must be had recourse to, as already explained. But extravasation of urine is not the only risk that demands our regard. That over, the risk by inflammatory action remains; a minor amount is likely to cause stricture; true inflammation will cause abscess; and this, communicating with the urethra, will degenerate into perineal fistula. Leeching, fomentation, rest, and antiphlogistic regimen, are therefore very essential after the injury. Neglect a severe kick or blow of the perineum, and stricture, abscess, and fistula are almost sure to follow.

Everard Home, Practical Observations on the Treatment of Strictures in the Urethra, &c. Lond. 1805. Arnott, Treatise on Strictures of the Urethra, &c. Lond. 1819. Charles Bell, Treatise on Diseases of the Urethra, &c. by Shaw, Lond. 1822. Ducamp, Traités des Retentions d'Urine Causées par le Rétrécissement de l'Urètre, &c. Paris, 1822. Lisfranc, des Rétrécissements de l'Urètre, Paris, 1824. Macilwain, on Stricture of the Urethra, Lond. 1830. Amussat, Leçons sur les Retentions d'Urine Causées par le Rétrécissement du Canal de l'Urètre, &c. Paris, 1832. Stafford, on Strictures of the Urethra, Lond. 1836. Brodie, Lectures on Diseases of the Urinary Organs, Lond. 1842. Wade, on Stricture of the Urethra, &c. Lond. 1853. Syme, on Treatment of Stricture by Perineal Incision, Edin. 1849. Lizars, on Strictures of the Urethra, &c. Edin. 1851. Wakley, Lancet, 1851. [Civiale, Traité des Maladies des Organes Génito-Urinaires, Paris, 1851. Gross, Diseases of the Bladder, &c. Philad. 1851.—Ed.]

CHAPTER XXXV.

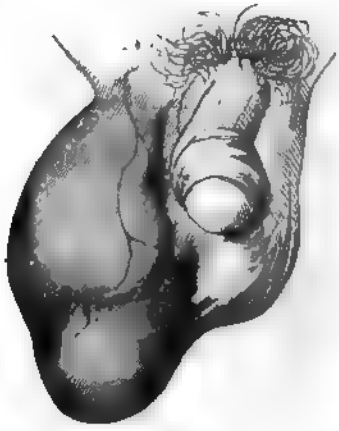
AFFECTIONS OF THE TESTICLE.

Orchitis.

The inflammatory process affecting the testicle may be acute or chronic; original, as following external injury; or secondary, the consequence or attendant of gonorrhœa. Sometimes it is an accompaniment of Mumps—inflammatory enlargement of the glands in the upper part of the neck; not improbably depending then on metastasis.

Secondary gonorrhœal orchitis is usually acute, and is the most frequent form of the affection. It is also known as *Hernia humoralis.* There being an increased susceptibility in all the genital system, during the existence of gonorrhœa, orchitis may be lighted up at any time, by the application of a slight exciting cause; a squeeze, excess in walking or diet, exposure to cold and wet, or premature use of strong injection. But, without any apparent exciting cause, the attack is liable to occur; and then seldom, until some time has elapsed—usually in the third week of the gonorrhœa. It may be the result of metastasis; more frequently, the action extends by continuity of tissue, descending along the vas deferens; seizing on the epididymis, and chiefly residing there. In fact, the affection may in strict language be designated as an Epididymitis; although the whole testicle seems to swell, yet the epididymis is the true seat of disorder, and the general swelling depends chiefly on acute effusion of serum into the tunica vaginalis. Pain, and a sense of weight are felt in the cord and testicle, the skin reddens, and uneasiness is felt in the groin and loins. The swelling and pain increase, often becoming excruciating; and then sensation in the loins is as if the back were sawn across. Discharge from the urethra diminishes, and ceases—an example, generally, not of metastasis, but of the effect of counter-irritation. The scrotal swelling becomes tense, red, glistening, and intolerant of the slightest pressure; the cord, too, is swollen, red, and painful. Fe-

Fig. 237.



Acute Orchitis; attendant on gonorrhœa.

brile disturbance is considerable; and vomiting is both a common and distressing symptom. Sometimes such pain is complained of, in the lower part of the abdomen, as to lead to a simulation of enteritis—and for this the complaint has actually been mistaken.

Treatment requires to be decidedly antiphlogistic; leeching, rest, fomentation, low diet, antimony. Recumbency is essential; and the weight of the tumor must be taken off the cord, by suspension, or by the arrangement of a pillow between the thighs. Opiates, too, are of much service; in full doses, and of frequent repetition. When the body of the testicle is undoubtedly involved in acute action, the antiphlogistic use of mercury is both warrantable and expedient; to save, if possible, the delicate structure of the gland. If tension be great, it is well to open a vein in the scrotum; at the same time perforating the tunica vaginalis with the lancet, so as to evacuate the accumulated serum. French surgeons have advised that the puncture should implicate the testis; but this does not seem necessary, the testis seldom being so affected as to require wound for the relief of tension; and it is inexpedient also, on account of the risk of exciting or aggravating intense inflammatory action there, from which the patient might otherwise have been exempt. As the action subsides, resolution may be hastened by stimulants to absorption; a solution of the iodide of potassium, with iodine, may be painted on the surface, and pushed to vesication; at a more advanced period, a gum and mercurial plaster may be applied; or pressure may be made by means of adhesive plaster, cut in stripe, and applied as if to a limb—the testicle being separated from its fellow, and made to protrude, so as to admit of such application. By some, it is proposed to apply this pressure from the first; but, surely, its proper place is only after the chronic stage has been fairly established. In the acute stage, pressure, however carefully applied, must prove intolerable, or at least must cause aggravation, if the action be resident in the testicle itself. In the case of epididymitis, there may be a greater tolerance of the application; but still its usefulness as an antiphlogistic is more than doubtful.

As the complaint yields, discharge may be expected to reappear at the orifice of the urethra. Very frequently, resolution is incomplete; hardness and swelling remaining in the epididymis. These require active perseverance in the employment of local discutients; and the iodide of potassium may be useful internally. In some cases, resolutive absorption is not only rapid but excessive. The gland, after regaining the normal size, continues to diminish, and may ultimately dwindle down to a mere shred, wholly destitute of the peculiar function.

Sometimes *Abscess* forms; but seldom, in gonorrhœal orchitis, unless some casualty or mismanagement have occurred, so as to involve the testis in true inflammation. In simple orchitis, however, the result of direct injury, the occurrence is not so rare. It is attended with much suffering; and the tubular structure of the organ is endangered. An incision must be made as soon as matter has formed; and, in the after treatment, care must be taken to obviate the tendency to fungous protrusion which the substance of the testicle usually manifests.

Chronic Orchitis, and Fungus of the Testicle.

Chronic orchitis may be the result of an acute attack, imperfectly resolved; or—as more frequently happens—the action may be chronic from the first; it also may be either primary or secondary—that is, occurring as an independent affection, or as a consequence of gonorrhœa. Very frequently, it depends on stricture of the urethra; not unfrequently it is of syphilitic origin. The body of the testicle is completely involved, as well as the epididymis—though the latter is usually first affected. The swelling, at first irregular, extends from the lower part of the epididymis, and involves the whole organ in a firm, inelastic, uniform tumor, usually of an oval form, and seldom exceeding twice or three times the bulk of the healthy gland. The attendant uneasiness is slight; and, after some time, the characteristic sensibility of the organ under pressure is in a great measure lost.

The enlargement is found to depend in part on the deposit of a yellow, cheesy, fibrinous exudation, condensed, non-vascular—intra-tubular, as well as in the interposed areolar tissue. On making a section of the tumor, after removal, this deposit and its peculiar characters are very apparent.

Slow softening of this deposit may take place; matter is formed; the swelling increases, with subacute exacerbation; the integument thins, and gives way by ulceration; and through the opening the tubular structure protrudes, in the form of a hard, firm, light-colored, comparatively painless, and slowly increasing fungus. The softening, in such a case, is but partial, and the amount of suppuration slight. Not unfrequently, opening and protrusion take place apparently without the intervention of any such action; the tunica albuginea gives way, under gradual increase of deposit; the tunica vaginalis becomes adherent, and ulcerates at this point; and then the integument soon yields also. If the opening be small, the protrusion may be proportionally trifling. But, sometimes, almost the whole of the organ projects; its surface studded with granulations, from which a copious thin secretion is discharged.

Chronic orchitis requires the ordinary discussive means for its arrest and removal, and abstraction of the cause, when practicable, is not to be omitted. Simple enlargements of the testicle always lead to a suspicion of stricture in the urethra, and that canal is examined accordingly. If stricture be found, it must be removed, before any amendment can be expected from treatment directed towards the testicle. When syphilis is the originating cause, indicated by the history of the case, large size, and slow progress of the tumor, the concurrence of other syphilitic signs, and nocturnal exacerbations of pain in the testicle, that taint must be combated by the appropriate means, and cautious mercurialism may be required.[1]

[1] Authors speak of two forms of syphilitic orchitis, simple and tubercular; the former seldom suppurating, and usually requiring mercury for its cure: the latter often becoming disorganized, and better treated by a combination of iodide of potassium, with gentle mercurials. Mr. Hamilton thus describes these affections: "In the simple syphilitic sarco-

In the open condition, when fungus has formed, a slight operation is necessary, the object being to reclaim the fungus, producing absorption of the abnormal deposit, reducing the swelling, and clearing the tubuli. The thickened integument around, constituting the closely adherent margin of the ulcerated opening, is loosened by dissection; and, having been brought completely over the protrusion, is secured by suture. Consolidation takes place, partly by the first, but mainly by the second intention (*Principles*, 3d Am. Ed. p. 598), tendency to protrusion is repressed, and, by the contraction incidental to cicatrization, such pressure is exerted by the integument on the parts beneath, as leads to gradual removal, at least in part, of the abnormal structure. After cicatrization, such pressure may be supposed to continue, in some degree, for a time, and is then to be aided by the discussive means applicable to occult chronic enlargements.

This is infinitely preferable to the old method of shaving off the fungus from time to time, and treating the remaining wound as an ordinary ulcer. The cure was tedious, and, besides, frequent use of the knife in this way was tantamount to castration. By the new method, for which the profession is chiefly indebted to Mr. Syme,[1] cure is accelerated, and the function of the testicle is preserved. A question, however, still remains to be settled; whether the whole of the protruded part is capable of being reclaimed, whether the intra-tubular deposit will wholly disappear, and the tubes everywhere recover their normal state and function. The probability is that, in the outward part of the fungus, disorganization has often advanced too far to admit of this, and that, therefore, this portion, seldom more than a thin slice, may be removed by the knife, before the rest is covered in by raised integument, without sacrificing any recoverable virile power, and

cele the testicle will be found enlarged to the size of a lemon or turkey-egg, of an ovoid or pyriform shape, sometimes flattened at the sides, either uniform on the surface, or with the epididymis distinguishable as an irregular ridge along the back; hard, particularly in the situation of the epididymis; heavy, with the integuments of the scrotum of a dusky red; generally, neither tender nor painful, except that the hanging weight causes a feeling of uneasiness in the loins and inside of the thighs. In this respect it differs remarkably from gonorrhœal orchitis, where the tenderness is so exquisite and the pain usually so great." "The tubercular syphilitic sarcocele is much more common, and differs materially, both in local and constitutional symptoms, from the simple form. The testicle is enlarged from two to four times its natural size, but the increase of size is generally not remarkable; of very irregular shape, so that the ordinary form of the testicle is often entirely lost, presenting, instead, an uneven hard, knotty mass, in which it is impossible to distinguish the body from the epididymis. At other times, the irregularity is seen to arise from the enlarged and indurated epididymis, which gets of a great size compared to the body of the testicle; that remains but little altered, and readily distinguishable from it. In the gonorrhœal orchitis, we well know that the inferior globus of the epididymis is usually the part most enlarged and hard, and often keeps so long after the testicle has recovered; whereas, in the tubercular syphilitic sarcocele, I have more frequently met with enlargement of the upper globus of the epididymis, sometimes excessive and disproportioned to the other parts of the testicle. The reason of this may be, that in gonorrhœal orchitis the inflammation extends from the vas deferens at the inferior part of the epididymis to the cellular tissue external to it, with effusion of lymph, causing swelling and induration; whereas, in the tubercular syphilitic sarcocele, the swelling of the superior globus of the epididymis depends on the presence of a tubercle imbedded among the vasa efferentia of which it is constituted."—Hamilton, *Essays on Syphilis*, Dublin, 1849; see also *Lancet*, No. 1188, p. 620.

[1] Contributions to Surgery, p. 204, Edin. 1848.

with the effect of still farther expediting the cure. Often, the operation cannot be performed immediately on the patient's presenting himself; some days of preparatory treatment are usually necessary, that the part may be brought to a clean, granulating, and quiet condition, favorable to adhesive results.

Central suppuration may occur in chronic orchitis. The matter may slowly reach the surface, and be discharged. Sometimes, it remains long stationary, in the condition of chronic abscess. Then the fluid portion of the matter may be absorbed, while the solid part remains in a concrete mass, resembling tubercular deposit, but distinguished from it by being confined within a distinct cyst—what was the pyogenic membrane.

Scrofulous Testicle.

Tubercular deposit is not uncommon in the testicle, occurring either in aggregated masses, or diffused in the tubular structure, which becomes atrophied under the pressure of accumulation. Such affection is termed *Scrofulous Testicle.* The swelling is gradual and very indolent, little pain or uneasiness is felt, the tumor seldom attains to a large size, and the tubercular diathesis is usually indicated by strumous affections in other parts of the body. After a time, one of the prominences enlarges, reddens, and becomes painful; softening and suppuration have occurred there, the integument gives way, and pus and tubercular matter are discharged. The sore presents the ordinary appearances consequent on tubercular softening (*Principles*, 3d Am. Ed. p. 235). Other parts may soften, point, and break, and sinuses communicate one with another. After a time, the greater part of the tubercular matter may be discharged; then the swelling diminishes, and the sores assume a healing tendency. Should any considerable part of the tubular structure have remained entire, it may protrude and form a fungus, as in the case of simple chronic orchitis. This fungus may be repressed in the ordinary way, and solid and permanent cicatrization may occur. But, sometimes, a fistulous opening remains, discharging thin pus, with occasionally also the secretion of the tubuli, and then the condition of *Spermatic Fistula* is said to be established.

Treatment varies according to the stage of advancement. In the indolent state, discussives are employed, along with antistrumous constitutional treatment; and gradual subsidence of the swelling may result. In the softened state, incision is suitable—for evacuation. If then the amount of deposit and suppuration seems slight, cicatrization is to be attempted. If, however, as is more frequently the case, suppuration and deposit are extensive, it is well to favor speedy disintegration and discharge of the abnormal mass, by free use of the caustic potass. Afterwards, pressure, by strapping, is of much use in favoring closure and cure. Sometimes, the tubercular matter protrudes slightly; but this fungus is readily distinguished from that which is composed of the substance of the gland, by being of less size, soft, crumbling, varying, and temporary. For the one, preservation is suitable; the other requires destructive use of an escharotic. Sometimes the extent of

suppuration and disorganization in the part, and the degree of disturbance in the constitution, are such as to call for more summary procedure; and, to save the system, the part has to be sacrificed, by castration.

In the indolent stage of scrofulous testicle, and during the progress of simple enlargement dependent on chronic orchitis, it is not uncommon for serum to accumulate in greater or less quantity; masking the character of the tumor, and increasing its apparent bulk. It is detected by softness, translucency, and fluctuation. If the accumulation prove considerable, occasional removal by tapping is of use; permitting the discussive applications to act more efficiently on the solid enlargement.

Tumors of the Testicle.

These were wont to be included under the general term *Sarcocele*. The most common is the simple enlargement dependent on chronic orchitis. The scrofulous tumor is not uncommon. Occasionally, the fibrous tumor is found. Cystic sarcoma is as frequently formed here as in any other situation. Carcinoma and cancer are not of frequent occurrence. Cephaloma has no more frequent site; sometimes, though rarely, it is combined with melanosis; and sometimes the open medullary tumor degenerates into the condition of Fungus Hæmatodes.

These tumors present the ordinary characters, and require the ordinary treatment (*Principles*, 3d Am. Ed. p. 288, *et seq.*) The simple enlargements are capable of discussion. The strumous tumors may be either discussed or disintegrated. The rest can be removed only by castration. Prognosis, in the case of malignant formations, may be more favorable here, than at any other site.

Irritable Testicle.

This term is usually made to include mere increase of the sensibility of the organ, as well as decided neuralgia. The former is almost always dependent on some affection of the urethra, bladder, or kidney, or on disorder of the general system; and is to be remedied accordingly. But it may—like the tumid and sensitive breast of the female—be the temporary consequence of change at puberty; and it may also follow mere excess in venereal excitement.

The latter is a formidable disease; inasmuch as it is attended with great suffering, and is but little amenable to any treatment. Uneasiness is almost constant, the part is tender to the touch, and violent pain comes in paroxysms. There is little or no enlargement, or other morbid indication, in the organ; in general, it is intolerant of pressure and manipulation; and, during the paroxysm, it is retracted close upon the groin. The patients most liable to suffer from such affections are the weak, nervous, and dyspeptic; more especially if they have indulged in venereal excess. Occasionally, the affection is combined with cirsocele; and seems to depend on that morbid condition of the veins. But, in general, the origin of the affection is equally obscure as in most other cases of neuralgia. The treatment is such as is generally applicable to

this disease (*Principles*, 3d Am. Ed. p. 587). Among the more successful local applications, aconite, belladonna, and nitrate of silver may be mentioned; among those used internally, iron, and the liquor arsenicalis. Frequently, but little improvement follows the most skilful management; and the patient may be driven by his sufferings to demand castration. This request is seldom if ever to be complied with, however; inasmuch as the neuralgia is likely to return, in the cord; being not dependent on any local cause capable of being removed by the operation.

Atrophy of the Testicle.

Gradual wasting of the testicle may follow acute orchitis, as already noticed; and a blow or squeeze may result in this, with the intervention of a slight inflammatory process.[1] It is not uncommon for atrophy of the testicle to supervene on cirsocele. The pressure of hydrocele, too, would appear, in some few cases, to cause diminution of the gland; and the same result has followed the pressure of fatty or other tumors. Continence, and the prolonged use of iodine internally, are supposed to tend to atrophy; but the truth of the supposition seems more than doubtful. Suppuration of the testicle may cause disorganization of part of the tubular structure, with obstruction and consequent absorption of the remainder. Atrophy of one or both organs, it has been supposed, has followed injuries of the head. Occasionally, examples of the affection occur while no exciting cause can be assigned.

Obviously, but little is in our power in the way of treatment; except by removal of the cause, when that is practicable. In the case of cirsocele, for example, if we succeed in curing this, wasting of the testicle may be expected to cease. Restoration of the normal bulk, however, is scarcely probable.

Hydrocele.

The term denotes chronic accumulation of serum, in connection with the genital organs; and this may occur in more than one site; in the tunica vaginalis, in the cord, or in the sac of a hernia.

I. *Hydrocele of the Tunica Vaginalis Testis.*—There is no more common disease. It may follow on injury, and a minor amount of orchitis; sometimes it is attributed by the patient to a strain; very frequently there is no assignable cause. Swelling takes place slowly, and with little or no uneasiness; ascending from the lower part of the scrotum upwards. The tumor may ultimately attain to a large size, encroaching closely on the groin. It is of pyriform shape, except when much distended; and then the narrowness of the upper part is undone by expansion there. It is translucent, unless the coverings be preternaturally thickened. Fluctuation can be felt, unless distension is great. The testicle usually occupies the back of the cavity, near the middle—nearer

[1] Squeezing of the testicles is a mode of castration in oriental courts; complete atrophy being found to result. And the same method is applied to the lower animals; bucks, for example.

the lower than the upper part; and seldom can be felt distinctly. On grasping the tumor firmly at that part, however, a hard substance may be felt; and the patient experiences the peculiar sensation which compression of the testicle is calculated to produce. However translucent the rest of the swelling, at that part it is opaque. Sometimes the testicle is situate in front; and then can be felt distinctly. It is never found at the lower part of the scrotum, and separate from the general swelling, as in hernia. The finger and thumb can always be carried above the tumor, at its neck; and the spermatic cord can be felt free. The tumor has no impulse afforded to it, on coughing, or during any other exertion of the abdominal muscles; unless there be a communication between the cavity of the tunica vaginalis and that of the abdominal peritoneum—as in the case of congenital hernia. The accumulation generally consists of a straw-colored serum; and sometimes loose solid bodies are found, as in serous cysts elsewhere. The tunica vaginalis is, in general, merely distended; sometimes it is thickened; sometimes it is intersected, so as to constitute minor cysts. In simple hydrocele, the testicle and epididymis are structurally sound. Not unfrequently, however, they are the subject of chronic enlargement; and then the disease is technically termed *Hydro-sarcocele* (p. 570).

The treatment of hydrocele is either palliative or radical. The former consists in simply withdrawing the fluid, by tapping; the swelling and uneasiness are removed for a time; but they return, and sometimes rapidly. The latter treatment consists in withdrawing the serum, and injecting a stimulant fluid instead, whereby an acute congestion may be established, whose resolution, when complete, shall have the effect of restoring the normal balance between exhalation and absorption (*Principles*, 3d Am. Ed. p. 190). Simple tapping may be performed by the thrust of a lancet; the flat end of a probe being afterwards used to keep the wound open, during the flow of serum, if necessary. Or a flat trocar and canula may be employed.

When injection is contemplated, a round trocar and canula are to be preferred. The patient is placed erect. The surgeon, grasping the tumor firmly behind, with his left hand, renders it tense and prominent in front; then the instrument is entered, perpendicularly; afterwards it is passed obliquely upwards, so as to avoid wound of the testicle, and yet taking care that the obliquity is not such as endangers separation of the coverings of the sac, and non-entrance into the sac itself. The serum having been withdrawn, a caoutchouc bottle, with stopcock and nozzle, is adapted to the canula—or a syringe is employed; and the cavity is partially filled with some stimulant fluid. Port wine, undiluted, or a solution of the sulphate of zinc, used to be much employed. Now, the favorite injection is iodine, in solution; one part of the tincture to three of water. Or, a small quantity of pure tincture of iodine having been thrown in, may be permitted to remain permanently in the sac—disappearing ultimately by absorption. If the dilute injection be used, three or four ounces are injected; and are temporarily retained, by withdrawing the bottle or syringe, and turning the stopcock of its nozzle—which is left pendent from the canula. After waiting a few minutes, the patient will begin to feel pain in the testicle, shooting up

the cord into the loins; and a sensation of faintness will probably come upon him. Then the stopcock is opened, and the fluid drains away. The patient is put to bed, with the scrotum supported. If subsequent

Fig. 238. Fig. 239.

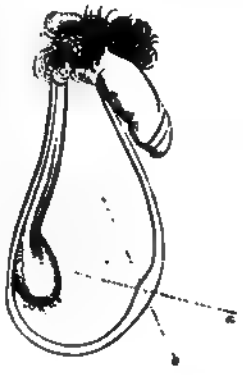


Fig. 238. Operation of tapping Hydrocele; the trocar entering.

Fig. 239. Diagram showing the direction of the Trocar; *a*, the direction of perforating, to avoid splitting of the parietes; the direction afterwards changed to *b*, to avoid wound of the testicle.

action threaten to be excessive, fomentation is applied, and antimony may be given internally. The tumor reforms quickly, with heat and pain; sometimes the acute accumulation seeming greater than the first. By and by, recession in the action gradually occurs; the tumor subsides; the pain ceases; and, in eight or ten days, we may expect to find the parts restored, permanently, to their normal state. It has been proposed to retap, for evacuation of the acutely effused serum, and thus to abridge the period of cure; but this seems to be, in most cases, unnecessary.

It is very seldom that the operation fails. Should it do so, it is to be repeated, with a stronger stimulant. The method by pure tincture of iodine, allowed to remain, is then specially suitable.

Before injecting any stimulant, it is most necessary that the surgeon satisfy himself that the point of the canula is fully within the cavity of the tunica vaginalis; otherwise, injection of the areolar tissue of the scrotum may take place, followed by sloughing, and severe constitutional disturbance.

A case of hydrocele presenting itself, injection cannot at once be determined on. It is first necessary to ascertain whether the testicle is sound or not; and this cannot be done until the serum has been discharged. If the organ be then found in its normal state, injection may at once be proceeded with. Otherwise, it must be delayed; we are first to turn our attention to cure of the chronic enlargement; and,

after that has been accomplished, the radical operation may then be undertaken. When the testicle is diseased, the accumulation of serum is but a symptom of this affection, and it is to be treated accordingly. The palpable cause of the redundant secretion must be removed; otherwise, reproduction can scarcely fail to occur. For the radical cure, by injection, is not effected by gluing the serous surfaces together, and obliterating the cavity of the tunica vaginalis, as was at one time supposed. The excited action seldom advances to plastic exudation; and the cure is simply by restoring normal function in the membrane.

A hydrocele of large size is not at once to be injected, though the testicle be sound. It is simply tapped; and when, by reaccumulation, an average bulk has been attained, then the radical cure is to be proceeded with.

The painful operations by seton, caustic, and incision are now fallen into complete desuetude. Of late, it has been proposed to operate by acupuncture; making small openings with a needle, through which the serum may gradually escape, partly externally, but chiefly into the areolar tissue—thence to be absorbed. The mode is tedious and uncertain; but being safe, and little painful, it may be had recourse to, when the patient decidedly objects to the ordinary treatment by injection.

Children are liable to hydrocele. And in them, treatment is very simple. We may succeed in dispelling the fluid, by discutient lotions —such as a solution of the muriate of ammonia; or by the external application of iodine, used cautiously. Failing in this, the serum is to be evacuated by the simple puncture of a lancet. And this, in the great majority of cases, is sufficient to effect a radical cure. The part swells, reddens, and is painful, as after injection in the adult; and, on resolution being completed, the parts are found in a normal state.

By the term *Congenital Hydrocele*, is usually understood a condition of parts such as leads to congenital hernia (p. 405); the vaginal process of peritoneum not having become obliterated. The fluid consequently communicates with the cavity of the peritoneum, usually by a small aperture; and may be made to disappear gradually from the scrotum. by pressure upwards. In treatment, the first object is to shut up the vaginal process; and this may in general be effected, by the constant pressure of a truss. In the child, this may suffice for the whole cure; absorption of the fluid being afterwards hastened by discutient applications. In the adult, the ordinary treatment may be necessary; but never is injection to be had recourse to, until we are satisfied that all communication with the peritoneum has been completely obliterated. To obtain this result, use of the truss is also important in another point of view. The testicle is liable to injury; by slight injuries the inflammatory process may, at any time, be lighted up in the tunica vaginalis: and, from thence, extension to the abdominal peritoneum will be easy and direct, unless the communication have been closed.

By *Encysted Hydrocele* is understood an accumulation of serous fluid within a cyst, or cysts, independent of the cavity of the tunica vaginalis. Such adventitious formations are usually found connected with that portion of the tunica vaginalis which covers the epididymis;

but they may arise in connection with any part, either of that membrane or of the tunica albuginea. The growth is more irregular than in common hydrocele, and the tumor seldom attains to a large size; the testicle is situated sometimes in front, sometimes on the lateral aspect; sometimes at the bottom; seldom on the back part, as in the common form; and the fluid is generally paler and less albuminous, than that which is found in the tunica vaginalis. When the bulk is such as to occasion inconvenience, tapping is had recourse to; and, if nothing contraindicate, injection may be practised. Should this fail—as is not unlikely, in the case of a plurality of cysts—a seton may be introduced, and retained until consolidation has occurred.

The tunica vaginalis has been found the site of much calcareous deposit, and filled with turbid fluid containing cholesterine. In such a case, cure can result from nothing short of free incision; and, after all, castration may not improbably be required.

Spermatozoa are sometimes observed in fluid withdrawn from hydrocele; and such fluid is usually of a milky appearance. It seems uncertain whether these have escaped from an accidental wound or giving way of the tubular structure, either of the testicle or of the epididymis; or whether the cyst, from which they are derived, has been formed by dilatation of a part of the tubular structure—as takes place in lacteal tumor of the breast, and in ranula. Whatever their origin, their presence is not found to contraindicate the ordinary cure by injection.

Hydrocele and hernia may coexist; and, as the former enlarges, the cord and abdominal aperture may come to be so occupied and compressed as to prevent hernial descent. A hydrocele, thus enacting the part of a truss, need not be interfered with, unless productive of much inconvenience by its weight and bulk.

II. *Hydrocele of the Cord.*—This may be either diffuse or encysted. The *Diffuse* form is comparatively rare. A serous fluid accumulates in the areolar tissue of the cord, and is inclosed in a distinct sheath; this again is covered by the cremasteric expansion. The swelling is seldom of large size; uniform, and somewhat pyramidal; of slow formation; and not attended with any considerable uneasiness. The base rests on the point where the spermatic vessels join the testicle, and is separated from the tunica vaginalis by a dense septum; hence the testicle is felt, distinct, in its ordinary site. If the abdominal aperture be not encroached upon, there can be no difficulty in diagnosis; but, when the swelling extends within this, it is apt to be mistaken for omental hernia. The chief points of difference are, the completeness in reduction of the hernia, the clearness of the cord after reduction, and the impulse given upon coughing; in the hydrocele, also, fluctuation is in general tolerably distinct. The fluid has been found reducible within the abdomen, but not into the abdominal cavity; passing up along the spermatic cord—probably in its areolar tissue—and, when past the abdominal ring, forming a distinct tumor in the abdominal parietes.

Unless the swelling prove large and inconvenient, it need not be interfered with. The best mode of cure, probably, is acupuncture, aided by local discutients. The punctures are made at the lower part of the tumor, and need not be numerous; for the fluid readily escapes from

space to space; and, not unfrequently, these are broken down into larger compartments.

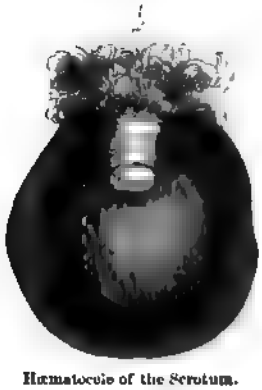
Encysted hydrocele of the cord is the more common variety. The serous fluid is contained within a distinct cyst; sometimes of adventitious formation; sometimes formed of an unobliterated portion of the vaginal process of peritoneum. Growth is slow and painless. The tumor is circumscribed, oval, tense, and fluctuating; often plainly translucent; always movable on the cord. The testis is felt distinctly separate. And no difficulty in diagnosis exists, unless, as sometimes happens, the swelling extend within the abdominal parietes. In general, however, the tumor can be pulled down from the abdominal aperture, permitting the cord to be felt free above; and, besides, the tumor can never be wholly reduced within the abdomen—a certain degree of tense fulness always remaining in the upper part of the canal. In the child, this affection will disappear under discutients. In the adult, it seldom demands interference. If it should, it may be got rid of by tapping and injection; or a seton may be temporarily applied.

III. *Hernial Hydrocele.*—When a scrotal hernia has been reduced, and the neck happily becomes obliterated, the sac, remaining, may be filled by serous accumulation. A pyramidal, fluctuating, and translucent tumor will result; of easy diagnosis; and amenable to the same treatment as an ordinary hydrocele. The affection is of rare occurrence.

IV. *Hydrocele in the Female.*—The term Hydrocele is applied to an œdematous state of the round ligament; analogous to diffuse hydrocele of the cord in the male. Also, a prolongation of peritoneum, along the round ligament of the uterus, may remain in communication with the abdominal cavity, by means of a narrow aperture at its neck; and this pouch may become the seat of serous accumulation, constituting a tumor analogous to congenital hydrocele of the male. Besides, the round ligament is liable to be the seat of cystic formation; analogous to encysted hydrocele of the cord in the male. The affections are rare, and seldom require active treatment.

Hæmatocele.

Fig. 240.



Hæmatocele of the Scrotum.

This may be the consequence of external injury; or it may be of spontaneous occurrence. By the term is understood an accumulation of blood, in one of three localities: the areolar tissue of the scrotum, the areolar tissue of the cord, and the tunica vaginalis.

1. *Hæmatocele of the Scrotum* is the result of bruise or oblique wound; and is analogous to an ordinary bruise, both in nature and in treatment. The scrotum swells, and is discolored; the hue is blackish, like that of urinous infiltration; but the diagnosis is easy, by attention to the history of the case—also noting that there are none of the signs of gangrene present, and that the system is com-

paratively unaffected. The treatment consists in arresting inflammatory action, and afterwards favoring absorption of the extravasated blood by local sorbefacients. Incision is withheld, unless suppuration have unfortunately occurred.

2. *Hæmatocele of the Cord.*—A spermatic vein may give way, under external injury, or great bodily exertion; and extravasation into the areolar tissue will result, forming a tense, discolored tumor there. The treatment is as for the preceding variety.

3. *Hæmatocele of the Tunica Vaginalis* is the most common form; and to it, in strict accuracy, the term may be limited. The blood is extravasated into the cavity of the tunic; and may be associated, or not, with hydrocele. By wound of the testicle, in tapping—or by a blow or other external injury, or by the spontaneous giving way of a bloodvessel—a hydrocele may at any time be converted into hæmatocele. The tumor suddenly increases in size, and is the seat of pain; and, when handled, is found heavier, and less fluctuating than before. The blood, if in small quantity, becomes diffused in the serous fluid; when copious, a portion coagulates, and assumes the fibrinous arrangement. This, acting as a foreign substance, may excite inflammatory action; and suppuration may take place, with much increase of swelling and pain. Very frequently, the affection is associated with chronic enlargement of the testicle—Hæmato-sarcocele.

When hæmatocele is unconnected with hydrocele, the treatment is as for other simple extravasation—antiphlogistic and sorbefacient; the formation of matter being the only indication which requires use of the knife. When the extravasation supervenes on hydrocele, simple tapping is in the first instance to be had recourse to. To inject then, however, would be productive of no good result; and, very probably, would cause overaction and suppuration. The fluid is allowed to collect again; and tapping is repeated. After several withdrawals, the fluid may be found once more of the same character as in simple hydrocele; and then injection may be proceeded with, not only in safety, but with a good prospect of success—provided the testicle is sound. In the confirmed cases—and more especially when suppuration is already threatened—the only mode of obtaining a radical cure is by free incision; laying the cavity fully open, turning out the coagula, and obtaining closure of the gap by granulation; care being taken to avoid wound of the testicle. If the tunica vaginalis be found thickened, and otherwise much altered, the greater portion may be cut away; as thus the amount of suppuration, and the period of cure, will be materially abridged.

Cirsocele.

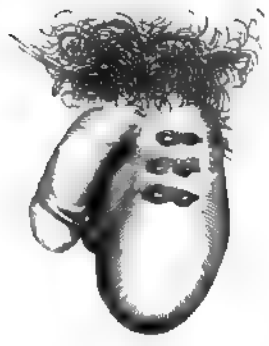
A varicose condition of the veins of the spermatic cord is termed Cirsocele, or Varicocele. The pendent nature of the part predisposes to this affection. And the ordinary causes are such as favor varix in general (*Principles*, 3d Am. Ed. p. 572); especially constipation, and laborious exertion in the erect posture; as also tumors, trusses, and whatever causes obstruction to upward flow in the cord. The left side is much more frequently affected than the right; the left testicle usually

hanging lower than the right; and the left spermatic vein being not only longer in its course, but also more exposed to compression by fecal accumulation in the sigmoid flexure of the colon. The swelling is usually pyriform; with its base on the testicle, its apex upwards; and on manipulation, the veins can be distinctly felt rolling under the fingers, like cords or earth-worms. There is a sensation of weight and uneasiness in the part; the testicle may be the seat of neuralgia, sometimes it becomes atrophied. An aching sensation in the groin and loins is not unfrequent. Sometimes the swelling proves very inconvenient, from its mere pendulousness and bulk; as in saddlers and others, who require close approximation of the thighs in their vocational labor—and in those who are much on horseback. Occasionally a mental despondency is observed, greater than the bodily ailment would seem to warrant.

Treatment is palliative or radical. The former consists in avoiding or removing the more obvious causes of the affection, keeping the testicle well supported by a bandage, and bathing the parts frequently in cold water. When the integuments of the scrotum are very redundant, the testicle may be retained in close contact with the groin, by invagination of the loose integument through a padded metallic ring. Or such trussing may be more effectually maintained, by removing the redundant skin by incision; support of the testicle being then intrusted to the cicatrix.

When the testicle is suffering either by neuralgia or by atrophy, or when much uneasiness and discomfort are experienced, eradication of the disease is naturally sought for. With this view, the varix may be treated here as elsewhere—by obliteration of the veins. 1. The actual cautery may be used; a heated wire being applied to the veins, isolated and fixed between the finger and thumb. The practice is safe and effectual, but the formidable nature of the application is a serious objection. 2. The veins may be compressed by suture, applied on needles passed beneath them by transfixion; as in ordinary varix (*Principles*, 3d Am. Ed. p. 575); care being taken to exclude the vas deferens and the spermatic artery. Obstruction of the duct is tantamount to castration, and obliteration of the artery can hardly fail to be followed by atrophy of the testicle. 3. The operation of M. Vidal may be performed. The varicose veins, having been separated from the rest of the cord, are placed between two silver wires, passed by the transfixion of needles, and emerging at the same openings. By twisting together the ends of the wires, the interposed veins are compressed; and, by a continuance of the twisting, they are rolled up round the wires, while at the same time the testicle is somewhat elevated. The ends are then secured, on a roll of bandage placed on the integument. By farther twisting of

[Fig. 241.]



[Veins compressed by needles and ligatures. (From Fergusson.) —Ed.]

the united ends, by means of a turnstick, the compression and twisting of the veins are gradually increased; and this is continued, until the wires free themselves by ulceration—thus declaring section and obliteration of the veins to be complete. 4. Obliterative pressure may be maintained on the veins at the groin, by means of a spring truss. But this, for obvious reasons, is not advisable. Moderate pressure there, however, is found very serviceable, not merely palliating, but sometimes obtaining cure; probably by affording support to the veins, while they are at the same time relieved from the superincumbent weight of blood. Such moderate pressure is best applied by a light and accurately fitted truss.[1] One great advantage of such treatment is its simplicity, and freedom from risk by phlebitis.

A variety of varicocele occasionally occurs, affecting the veins within the inguinal canal, and at the groin; while those of the scrotum are comparatively free. It is very liable to be mistaken for hernia, as formerly noticed (p. 388). The best test is the peculiar sensation imparted to the finger and thumb when the part is pinched and rubbed. Palliative treatment usually suffices. But should a radical cure be sought, the preferable means is the application of pressure by a truss.

Tumors of the Cord.

Occasionally, adipose tumors form in the areolar tissue of the spermatic cord. Their bulk is inconvenient, and their pressure may cause atrophy of the testicle. They are to be removed by incision. Fibrous tumors and osseous formations have also been found here; but are rare. The testicle, arrested at the groin, in its descent, may become affected by tumor; and in that situation may require removal by operation.[2]

Castration.

This severe and painful mutilation is seldom required, except for tumors of the testicle; malignant, or such as, though simple, are not amenable to either discussion or disintegration. In neuralgia of the testis, and in cirsocele, it is sometimes demanded by the patient; but in neither case is the surgeon warranted in acceding to the wish.

All hair having been removed from the scrotum and groin, the patient is placed recumbent. By grasping the tumor behind, the skin is made tense. The bistoury is entered at the neck of the swelling, and carried to its fundus; diverging over the body of the tumor, so as to include a sufficiency of skin within an elliptical incision. This form of wound is especially necessary, when a fungus, ulcer, or other involvement of the skin requires to be taken away. A simple rectilinear wound would suffice for removal of the tumor; but a redundancy of skin would be left, constituting a pouch for untoward accumulation of blood or pus. On the other hand, it is very necessary to avoid excessive removal of

[1] Curling, on the Testicle; and Thomson, *Monthly Journal*, Nov. 1848, p. 295. "Evans's moc-main lever truss" is very suitable.

[2] Lancet, No. 1214, p. 617.

the skin, lest, on contraction, a bare sufficiency be found for effectually covering the remaining organ. And, in connection with this, it is important to remember that the covering of a large sarcocele is borrowed from the adjoining parts; and that, consequently, after incision, a great degree of resilience in the integument is certain to occur. The dissection is advanced, first at the upper part of the wound, so as to expose the cord; this, having been isolated, is entrusted to the firm grasp of an assistant, to prevent retraction within the abdominal aperture; and then it is cut across. The apex of the tumor being now everted, dissection is rapidly proceeded with—a dissection rendered comparatively painless and bloodless, by early section of the cord. Care is taken not to wound the septum, and thus to expose the sound testicle. The arteries of the cord are then tied. And, should they have slipped from the fingers of the assistant, an upward enlargement of the superficial wound may be required. The scrotal vessels are secured with especial care; experience warning us that, otherwise, troublesome bleeding after reaction is almost certain to occur. The wound is brought together, and treated in the ordinary way. The lower part seldom heals but by granulation; and, therefore, need not be closely approximated. The cord requires to be carefully watched; diffuse suppuration being apt to occur there; and should this threaten, early incision must be had recourse to. But, by suitable antiphlogistic precautions, all necessity for resumed use of the knife may generally be avoided.

It is important to remember that, like hydrocele, sarcocele may coexist with hernia; and that the latter may be temporarily restrained by the bulk of the tumor of the testicle. On removal of this, however, the hernia, descending during the cries or straining of the patient may appear at the wound.

Impotence.

This may depend on imperfect development of the testis; but not on imperfect descent. The organs are as efficient, functionally, in the abdomen as in the scrotum. Ablation and atrophy of both organs cause impotence; but either testicle may be lost with comparative impunity. The oxalic diathesis, and diabetes, diminish the sexual appetite and power; and so does the phosphatic diathesis, to a less degree. The pressure of hydrocele may cause impotence, even without atrophy of the testicle. Affections of the brain are sometimes followed by it. In the newly married, a temporary loss of power is sometimes caused by mere predominance of mental emotion. Excessive venery, inducing an irritable state of the whole genital system, is perhaps the most frequent cause. Effete *roués* thus "read their sin in their punishment."

Cure can be expected, only in those cases which are unconnected with structural change in the testicles. The cause having been removed, certain medicines are supposed to have a tendency to restore this animal function, and are hence termed Aphrodisiacs. Of these, the most important are, Indian hemp, conium, and phosphorus; the two former most suitable in cases of irritability; the latter given, in very guarded doses, for the more chronic examples. Musk, cantharides, steel, and

other tonics, may also be of service; and diet should be generous. The mental cases may be left to work their own cure.

Spermatorrhœa.

An irritable state of the testicles, seminal vesicles, bladder, and urethra, with a turgid and especially irritable condition of the prostatic portion of the urethra, leads to involuntary and frequent emission of the seminal fluid. By much the most frequent cause of this morbid state is masturbation; and, next in order, comes excess in venereal indulgence. Stricture, prostatic diseases, and irritation communicated from diseased rectum, are common causes of minor forms of the affection. In consequence of the irritability, an impression much inferior to the normal stimulus suffices for production of seminal discharge. Slight venereal excitement, by day or night, causes emission; and semen is also discharged during straining at stool, and by the effort of evacuating the last drops of urine in micturition. The testicles are soft, and hang low in the scrotum, which is loose and flabby. Impotence results; by incapacity of erection, as well as by reason of preternatural haste in emission, and by the vitiated character of the secretion itself. The digestive organs become deranged; the general health fails; many anomalous sensations are felt, and many serious diseases are simulated; a dejected expression of countenance is acquired; and the air and bearing are those of a poltroon.

The principles of treatment are obvious. Chastity in thought, word, and deed; cold bathing, and a tonic system of treatment; regulation of bowels, but avoidance of purgatives, or other sources of local irritation and general exhaustion; early rising, cheerful society, and healthful occupation of body and mind. If the irritability continue, nitrate of silver may be applied to the posterior part of the urethra, by means of the porte-caustique of Lallemand.[1] This instrument having arrived at the tender part —which is at once indicated by the feelings of the patient—has the stylet projected, so as to expose the caustic; and, by gently turning the instrument, an efficiency of application is insured. Afterwards, strict rest, with antiphlogistic regimen, should be maintained for a day or two; and, if need be, sedatives are given, either by the mouth or by the rectum. Repetition may be required, after a considerable interval. In mild cases, the occasional introduction of a common metallic bougie may succeed in removing the irritability; rendering recourse to the more painful and hazardous cauterization unnecessary. Cold enemata, and counter-irritation in the perineum, may be of service. Compres-

[1] This instrument "consists of a straight or curved platina canula, or tube, rather smaller than a middle-sized catheter, through which plays a caustic holder; in the farther extremity of which there is a narrow groove, eleven lines in length, for the purpose of holding the caustic. After filling the groove with the nitrate of silver, by fusing it over a spirit-lamp, it becomes so securely fixed, that there is no longer any danger of it escaping. At the other end, there is a sliding screw, or stop, by which the action of the remedy may be limited to any extent less than the groove which contains it. Another sliding stop affixed to the canula serves, after the distance of the orifice from the part to be cauterized has been ascertained, to prevent the instrument passing farther into the canal. [See Fig. 285.—Ed.]

sion of the urethra, by a pad applied to the perineum, has also been found useful.[1]

This obscure and distasteful class of cases are still much in the hands of unprincipled practitioners and quacks. This is no reason, however, for leaving the unfortunate victims in such a predicament, or for denying the existence of such affections. Acknowledging the disease, it seems plainly the duty of our science and art to afford what assistance may be in our power, at the same time remembering, that without strict purity of conduct on the part of the patient, all treatment will prove of little avail.

On Diseases of the Testicle, see Warner, An Account of the Testicles, their Coverings and Diseases, Lond. 1774. Pott, A Treatise on the Hydrocele, &c. in his Chirurgical Works, vol. ii. Lond. 1783. Benjamin Bell, A Treatise on Hydrocele, &c. Edin. 1794. Earle, A Treatise on Hydrocele, Lond. 1796. Ramsden, Practical Observations on the Sclerocele, &c. Lond. 1811. Astley Cooper on the Structure and Diseases of the Testis, Lond. 1830. Russell, Observations on the Testicles, Edin. 1833. Curling, A Practical Treatise on Diseases of the Testis, &c. Lond. 1843.

---

[1] Ranking's Retrospect, vol. ii. p. 118. See also, on this subject, Lallemand, des pertes seminales involontaires, Paris, 1842. Brit. and Foreign Review, April, 1843, p. 346. Phillips, Med. Gazette, Jan. 1843. Civiale, Mémoire sur l'Emploi des Caustiques dans quelques Maladies de l'Urètre, Paris, 1842.

CHAPTER XXXVI.

AFFECTIONS OF THE SCROTUM AND PENIS.

Erysipelas of the Scrotum.

ERYSIPELAS not unfrequently attacks the scrotum, in a distinct and marked form, peculiarly asthenic in its type, partaking much of the characters of diffuse areolar infiltration. It occurs in adults of weak and broken-down system, given to drink and other dissipation, and usually follows a kick, blow, or other injury. Swelling is great and rapid, with marked symptoms of constitutional irritation from the commencement. Thin, unwholesome matter speedily forms, and is diffused into the areolar tissue. The skin—at first red, tense, and glistening—blackens, or assumes a tawny hue, shrivels, and becomes cold and fetid. Sloughing is begun and advancing. Very frequently the groins are involved, and the mischief extends upwards in the abdominal parietes. The constitutional symptoms soon pass from the irritative into the typhoid type, and fatal sinking follows. Local and general safety can be obtained only by early and active interference, free incision, and constitutional support (*Principles*, 3d Am. Ed. p. 223).

Erythema may occur at any time in the scrotum, under the ordinary exciting causes. It follows the ordinary course, and requires the ordinary treatment.

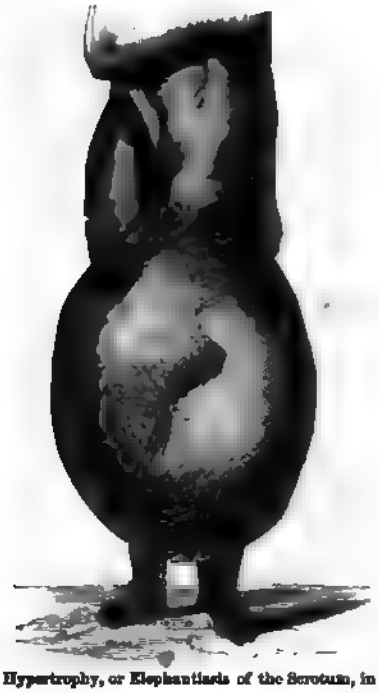
The areolar tissue of the scrotum is very liable to œdema, occurring sometimes as a distinct affection, much more frequently as a concomitant of general anasarca. When excessive, relief and diminution may be obtained from a few dependent punctures, made cautiously, however, lest asthenic and diffuse inflammatory action ensue.

Elephantiasis of the Scrotum.

The scrotum is liable to chronic enlargement by hypertrophy, forming a large, simple tumor, within which the genital organs come to be altogether concealed, the prepuce alone remaining visible, at the lower part of the swelling, thickened, and warty; and from this point the urine is discharged in a scattered stream. The affection is much more frequent in hot climates than in this country. There is no cure, but by use of the knife. When the tumor is of no vast size, the incisions may be planned so as to save the penis and testicles, and dissection is conducted cautiously with this view.[1] In the case of a large tumor,

[1] Farther details of this affection, and of the operative treatment required, with diagrams, will be found given by Dr. Brett, *Lancet*, No. 1174, p. 241.

Fig. 242.



Hypertrophy, or Elephantiasis of the Scrotum, in a Hindoo.

Fig. 243.

An aggravated example of Chimney-sweepers' Cancer; much superficial texture destroyed.

however, such an attempt may be hazardous, the patient being apt to undergo fatal exhaustion, under the tedious and painful operation, and the copious loss of blood. It is then better, probably, to sacrifice everything, and to effect removal, at once, by a few rapid strokes of a long bistoury. Before proceeding to any operation, however, and more especially to summary ablation, it is most necessary to ascertain whether or not scrotal hernia exist. If such be found, the incisions must be planned and conducted with peculiar care.

Chimney-Sweeper's Cancer.

The integuments of the scrotum are liable to malignant ulceration; more frequently found in chimney-sweepers than in others—probably on account of the irritation of soot, and habits of uncleanliness; but not limited to that peculiar vocation. The ulcer begins in the form of a wart; and frequently is surrounded by warty formations. It may spread rapidly. Cure is by excision, or by thorough destruction by means of chloride of zinc paste; and certainty of success is to be hoped for only at an early stage—when the disease is as yet limited to the integument, and when no great amount of even this tissue is involved. At a more advanced period, when the testicle is exposed, and probably contaminated, a chance may yet be afforded by castration; provided the groins are free from secondary enlargement, and the constitution is not much broken down.

Priapism.

Permanent erection of the penis occurs in three forms. 1. From injury of the spine. This has been already noticed, as a distressing symptom of spinal fracture (p. 335). 2. From vascular and nervous excitement, induced by excessive venereal stimulus. The turgescence may be such

as temporarily to occlude the urethra, causing retention of urine; and this is to be treated by antiphlogistics and antispasmodics, as formerly noticed (p. 497). 8. A more formidable variety may occur, from the same cause as the preceding; dependent on extravasation of blood into the corpora cavernosa—a vessel of some size having given way. In a case of urgency, it may be necessary to evacuate the extravasated blood by incision; but, in general, it is better to treat the case according to the general principles applicable to bruise; averting inflammatory action, and favoring absorption. If incision be made, there is great risk of troublesome suppuration following; incapacitating the organ afterwards for normal erection.

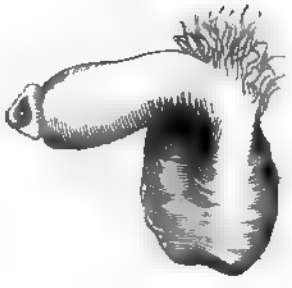
Sometimes chronic deposit, of a plastic kind, and probably of inflammatory origin, takes place in the corpus cavernosum; producing thickening, perhaps with enlargement of the part, and more or less obliteration of the erectile tissue. Erection, consequently, is imperfect and painful. Treatment will mainly consist of counter-irritation and sorbefacients to the part, with alteratives internally. Should stricture coexist, that must be removed in the ordinary way.[1]

Phymosis.

Phymosis and Paraphymosis both depend on preternatural contraction of the preputial orifice; the difference being, that in the one case the contracted portion occupies its normal position in front of the glans; in the other it is reflected behind the glans, and acts as a constriction there on the body of the penis.

Phymosis may be congenital; an original malformation. In this case, if the contraction be great, the child is apt to suffer much. The urine escapes imperfectly; and, in consequence, chronic balanitis may ensue, or a calculous concretion may form. In after life, the preputial contraction may have the same effect as a tight stricture of the urethra; causing first irritability of the genito-urinary system, afterwards organic change—stricture of the urethra, alteration in the coats of the bladder, dilatation of the ureters, and finally renal disease. Should these dangers pass by, and an advanced age be reached by the patient, ulceration is apt to take place at the contracted part; and, very frequently, the ulcer assumes ultimately a malignant action, and extends so as to involve the glans and body of the penis. It is important, therefore, on many accounts, to remove this source of evil as early as possible.

Fig. 244.



Phymosis.

Acquired phymosis may be acute or chronic. The former is the result of an acute inflammatory process; following external injury; or

[1] H. J. Johnson, Lancet, No. 1473, p. 481.

sympathetic with gonorrhœa, balanitis, or venereal sores. The areolar tissue becomes infiltrated with serum; the swelling, thus caused, prevents the glans from being uncovered in the usual way; and discharge accumulating, aggravates the disorder. The main treatment is by rest, fomentation, poultice, and general antiphlogistics. And, under this management, swelling may more or less rapidly disappear, and the normal state be regained. Failing this, and if there be urgency for exposure of sores—which may be extending rapidly, and may require activity in direct applications—incision is necessary. It may be that the urgency is such as to demand incision very early in the case, while the sores are yet fully impregnated with virus; and then there is risk of the disease being much extended, by contamination of the recently made wound. Such risk may be in a great measure obviated, however; by applying an active escharotic immediately to the sore, so as to annihilate both the local poison and the poisoned part; and by touching the wound slightly with the nitrate of silver, so as to make a protecting crust on the raw surface. In general, the operation is to be delayed, until the sores are of such a date as to render impregnation of the wound at least improbable—the reparative stage having been reached, when discharge probably ceases to be virulent (p. 525).

The chronic form of acquired phymosis may result from gradual increase of original malformation, or from cicatrization of ulcer or wound. Like the congenital form, it is to be relieved only by operation. And this may be performed in various ways.

1. A simple and very suitable mode consists of inserting a director into the preputial cavity, retaining it by the side of the fraenum, introducing on it a sharp-pointed curved bistoury, and by this transfixing and dividing the prepuce at its lower aspect. The director's point must in the first instance be moved about freely, to make sure that it is in the preputial cavity, and not in the urethra. The site of the incision is chosen, for obvious reasons. If placed on the dorsum, two unseemly flaps are formed, and the glans is left permanently uncovered. By the side of the frænum, a less amount of wound suffices; the glans is equally well exposed; and, after cicatrization, no unseemliness results, nor is there any departure from the normal relative position of the parts. To prevent resilience of the integument from the mucous membrane, and thereby to prevent an unnecessary extent of raw surface, a fine suture on each side is required; and this is retained, until spontaneously freed by ulceration, or until consolidation has taken place by plastic exudation—whereby the natural resilience is obviated. 2. When the prepuce is redundant in front of the glans, the following operation is suitable. The prepuce having been stretched, so as to clear the glans, the mere orifice is taken away, by the stroke of scissors or a knife. Circumcision, in fact, is performed, to a limited extent. The skin is found free enough, but the mucous membrane is still tight; and this is slit up, by scissors, at two or more points. The end of each flap of mucous membrane is then secured, by a fine suture, to a corresponding portion of the integument. This mode of procedure is well suited to those cases, which are connected with a cluster of venereal sores on the very verge of the prepuce; both diseases being got rid of at once. It is also ad-

visable when, in any case, the end of a long prepuce is much indurated or otherwise permanently altered in structure.

[Mr. Fergusson is in the habit of attaching together the mucous membrane and integument at several points, instead of only at the point of the flaps of the mucous membrane. The advantage of introducing several fine sutures is, that union by primary adhesion will probably occur; and thus the liability of cicatrization and *contraction*, consequent on the granulating process will be obviated or diminished, with proportionate diminution in the probability of reproduction of the stricture. (*Fergusson, op. cit.*)

For the same reason, the use of a few sutures in the operation last described by Professor Miller would probably be an improvement upon it.

Another very neat operation is that of Cullerier. It is applicable to those cases of Phymosis, in which the integuments do not appear to be much condensed or indurated; but in which the stricture is due chiefly to the more unyielding mucous membrane. The operation consists in passing the blunt-pointed blade of a pair of very delicate scissors between the glans and the prepuce, while the sharp-pointed blade is thrust into the substance of the prepuce, being separated from the other blade by the mucous membrane; the latter is now divided to a sufficient length to allow the prepuce to be drawn back. This operation has been frequently performed by Dr. Peace, of this city, and with success.—Ed.]

Paraphymosis.

A tight preputial orifice, reflected behind the glans, and permitted to remain there, constricts the body of the organ, and gives rise to very unpleasant consequences. The superficial areolar tissue swells greatly, on each aspect of the stricture; the glans swells too; and an acute inflammatory process is kindled, under unfavorable circumstances—the strangulated parts being obviously ill provided with the power of resistance or control. There is the same necessity for relief, as in the case of strangulated hernia, so far as the preservation of structure is concerned; and relief is sought in the same way. Reduction generally is practicable, in recent cases. The patient's trunk having been steadied, and the parts well oiled, the surgeon grasps the glans with the fingers of the right hand, and makes steady pressure thereon, also pushing it steadily from him; at the same time, with the fingers of the left hand, he draws forward the constricting orifice; the object being to push the glans, diminished by pressure, through the narrow preputial orifice.

Failing in this, and there being no marked urgency, another mode of reduction may be attempted. The penis is placed erect, and on the glans a stream of cold water is maintained for some time. This may have the effect of so diminishing the bulk of the formerly turgid part, as to admit of its being replaced without much difficulty within its preputial covering.

But should these attempts at simple reduction fail, or should the case be already so far advanced as not to warrant their being practised, incision is required. And little more than a scratch suffices, if rightly

Fig. 245.

Paraphymosis; the dark portion is the lining of the prepuce, reflected; the preputial orifice, the seat of stricture, is behind, between the two swellings.

placed. The general bulge behind the glans is not to be widely laid open; but it is separated, by means of the fingers, into its two component parts. In the depth between these, the constriction is found, as a narrow band or thread; and that alone requires division. After reduction, the wound seems a mere notch in the preputial verge.

If neglected, the glans may slough or ulcerate very destructively; or, the glans remaining merely congested, the stricture may cause ulceration of the body of the penis, opening the urethra, and producing urinary fistula. Operating lately on a case of this kind, in a boy, after the paraphymosis had existed unreduced for three months, I divided a piece of thread which encircled the penis—deeply imbedded in it—and which had been secretly applied as a jugum, to prevent punishment on account of enuresis (p. 494).

When paraphymosis and venereal ulcer of the glans coexist, there is an especial necessity for immediate relief; otherwise, acute phagedæna, or sloughing, cannot fail to supervene. It may happen that the constriction has been slight, and of old standing; and that, in consequence, even after extensive incision on the dorsum of the penis, reduction is found impracticable; the parts being firmly glued to their abnormal site by plastic exudation. Under these circumstances, we must be contented with simple relief of the stricture, by suitable incision; leaving restoration of normal relative position to be effected, when resolution of the inflammatory action has become complete.

Hypospadias.

This term denotes an imperfect condition of the urethra, at or near its orifice; the result sometimes of accident or disease, but usually a congenital malformation. There may be a vestige of the normal opening at the apex of the glans, the urethra terminating somewhere behind this; or, as more frequently happens, the anterior portion of the canal—to the extent of an inch or more—appears as if slit up, the margins of the wound having become rounded off; in other words, the lower part of the wall of the canal is deficient. In extreme cases, the whole antepubal part of the urethra may be thus imperfect. The inconveniences of the affection are, a scattered and ill-projected stream of urine, perhaps inefficient emission of the seminal fluid, and a raw, congested state of the exposed mucous membrane. When there is rather a slitting up, than a deficiency of parts, the edges may be pared and brought together over a catheter. When the parts are actually deficient, autoplasty must be had recourse to; a portion of integument being borrowed from the neighboring perineum or scrotum, and engrafted into the hiatus. In the minor cases, however, which constitute a decided majority, no interference is necessary; the inconveniences, if any, being slight.

Hyperspadias or Epispadias.

This is an analogous, but opposite state; the splitting up—or rather the non-development—having taken place on the dorsal aspect. The chasm may extend from the glans to the symphysis pubis. In general, there is a sufficiency of parts to admit of paring the edges, and approximating them by suture over a catheter. Immediate union is not likely to occur at every part; but permanent closure may ultimately be obtained, either by repetition of the operation at the unclosed points, or by occasional application of the heated wire.

Imperforate Urethra.

A congenital malformation, in this respect, is obviously to be remedied in but one way; by the plunge of a round trocar and canula, in the proper direction; and by keeping the artificially constructed canal pervious, by the lodgement of a catheter—changed occasionally to prevent calculous deposit.

Malignant Disease of the Penis.

This is found only in the aged; and frequently, as already stated, it may be traced to the irritation of congenital phymosis; beginning in the preputial orifice, by ulceration, and extending thence to the body of the organ—or, it may be, beginning in the glans itself. The glans is enlarged and indurated; angry ulcers penetrate it in various places; the body of the penis suffers likewise; the lymphatics on the dorsum swell and harden; the glands of the groin are involved; retention of urine may ensue, by pressure of the secondary tumors on the neck of the bladder; the cachexy advances; and the patient perishes—his end perhaps hastened by hemorrhage from the open and deep cancer.

Nothing but the knife can afford a chance of cure. When the prepuce alone is affected, its removal is sufficient. Sometimes a malignant ulcer attacks the integument of the body of the penis, originating there; it may be long and successfully resisted in its advance, by the dense fibrous fascia which invests the organ subintegumentally; and, in such a case, removal of the affected surface by dissection may suffice. When the glans and body are involved, nothing short of amputation of the entire thickness affords a prospect of cure—cutting in sound parts, between the disease and the symphysis pubis; and the attempt is warrantable, only when as yet the lymphatics show no sign of implication. When the glands are already enlarged, there is nothing left in our power but palliation; and, as formerly stated, puncture of the bladder above the pubes may be required, towards the close of the case, on account of retention of urine (p. 499).

I lately met with an affection which strongly simulated malignancy. In a gentleman of middle age, one half of the lining membrane of the prepuce was occupied by a flat growth; partly warty and hard, partly smooth and villous, in every part highly vascular. This was the seat of

intense irritation; the least touch was agony; frequently, pain shot violently down the thigh; sleep was denied at night; the general health was wasted; and the patient professed himself, as he seemed, most miserable. The corresponding part of the glans was red and excoriated. The disease was removed freely by the knife; and perfect cure resulted.

Amputation of the Penis.

This is had recourse to on account of malignant disease, affecting the body of the organ; but only when there is a sufficient space of sound texture between the disease and the pubes, and when the glands yet show no sign of contamination. The ordinary mode of performance is exceedingly simple. The organ, stretched by the left hand pulling it outwards, is lopped off by one sweep of an ordinary amputating knife—laid upon the part, and moved rapidly across from point to heel, or conversely. The integument is encouraged to contract towards the pubes; so that, during the puckering of cicatrization, it may not overlap and interfere with the orifice of the urethra. And this is kept of the normal caliber, by a suitable use of bougies.

Ricord's method of operating is preferable, however, being well calculated to obviate the principal difficulty—namely, tendency to contraction in the orifice of the urethra. Rapid healing of the wound is also promoted; and, at the same time, a sufficient covering is provided for the corpora cavernosa. The procedure is conducted thus: After amputation in the ordinary way—enough skin being left to cover the corpora cavernosa, and no more—the surgeon seizes with forceps the mucous membrane of the urethra, and with a pair of scissors makes four slight incisions, so as to form four equal flaps; then, using a fine needle, which carries a silk ligature, he unites each flap of membrane to the skin by a suture. The wound heals by the first intention; adhesions form between the skin and mucous membrane; and these textures become continuous—a condition analogous to what is observed at the other natural outlets of the body. The cicatrix then contracting—instead of operating prejudicially, as in the old method—tends to open the urethra, by pulling its lining membrane outwards.

When, in the case of a short stump, inconvenience results from inability to direct the stream of urine in a sufficiently outward jet, the deficiency of the organ may be temporarily compensated, when the patient makes water, by a mechanical adaptation—a funnel-shaped canula, of sufficient length, its base resting on the pubes.

Travers on Phymosis and Paraphymosis, Lond. 1818. Earle and Travers on Chimney-Sweeper's Cancer, Med.-Chir. Trans. vol. xii. Larrey, Mém. de la Chir. Militaire, tom. ii. p. 110. Titley, Med.-Chir. Trans. vol. vi. p. 71. Liston, Edin. Med. and Surg. Journal, vol. xix. p. 566, 1823. Key, Case of Hoo Loo, Med. Gazette, vol. viii. p. 93, 1831. Bergson, Die Beschneidung vom Historichen, &c. Berlin, 1844.

CHAPTER XXXVII.

AFFECTIONS OF THE FEMALE GENITAL ORGANS.

THE affections included in this chapter are considered very briefly, the great majority belonging to the exclusive province of the obstetric practitioner.

Inflammation of the Vulva

Occurs at all ages. In the adult, it presents no marked peculiarity in its history or treatment.

In the child, it forms the disease generally called infantile gonorrhœa, or infantile leucorrhœa. This affection, which was long mistaken for the result of attempted impure connection, may occur at any period of adolescence. It is most frequently seen in delicate, unhealthy children; and more among the children of the lower than of the higher classes. Not unfrequently it comes on during convalescence from the eruptive fevers, or during teething (p. 522).

Sometimes no cause can be assigned; or it may be induced by worms or other rectal irritation, by want of cleanliness, or by exposure of the parts to damp and cold.

The symptoms are, constant irritation and pain, so that the child is frequently moving its hand towards the part; pain and scalding in making water, to which the calls are sometimes inordinately frequent; and, in addition, the ordinary signs of slight febrile excitement.

On inspecting the pudenda, they are found bathed in pus; the whole surface of the vulva is swollen, red, and tender; and there is frequently, on and around the vulva, an eruption of a few red and inflamed spots, which may either disappear, or go on to form small pustules.

Treatment is simple. In mild cases, nothing but cleanliness may be required. In the more severe, it is necessary to exhibit laxative and alterative medicine, to keep the patient in bed, to allay feverish irritation by hot bathing, to apply locally hot fomentations at the outset, and subsequently to use various washes—as a weak solution of nitrate of silver, or of sulphate of zinc. The decoction of poppies is often useful to remove irritation. If the skin is broken, care must be taken, during the healing, to prevent cohesion of the labia.

Sometimes the disease affects children along with a low form of fever; and the inflammation may go on to sloughing. The vulva is also sometimes the seat of extensive and unhealthy ulceration, and of *noma*, with accompanying fever of a low typhoid character.

Abscess of the Vulva

May be the result of mechanical violence, or the secondary consequence of sanguineous extravasation into the subcutaneous or submucous areolar tissue. It may follow erysipelas, or acute phlegmonous inflammation of the glandules of the areolar tissue of the part, arising without assignable cause. Occasionally, there is a succession of such abscesses in the vulva; apparently induced by inflammation or irritation of the vagina, or of the deeper-seated organs. It is a common affection of prostitutes; and in them frequently ends by forming fistulæ. When the disease is a consequence of sanguineous extravasation, it also sometimes ends in fistula; the purulent deposit extending, like the sanguineous, from the vulva upwards along the walls of the vagina—or in other directions, as toward the anus.

The origin and progress of abscess in this situation does not materially differ in any respect from its history as originating elsewhere. Generally, the accompanying pain is severe; but if the abscess has followed extravasation of blood, the pain and constitutional symptoms may be comparatively slight.

The affection is distinguished from thrombus by the presence of more or less fever, by the acuteness of the pain and tenderness, by gradual progress of the swelling, and by the color of the integument over it; from varicose veins of the vulva, by its sensibility on pressure; by its tension, and by not disappearing when the patient lies down; from hernia, by the absence of impulse on coughing, its history, progress, &c. There is no special point to be attended to in the treatment. The abscess should be opened early; and, in preference, from the skin, not from the mucous membrane. Every attention must be paid to the encouragement of speedy healing, in order to avert the danger of the formation of fistula. If, in spite of all care, a *fistula vaginæ* does form, and proves tedious, it must be dealt with in the same way as fistula in ano (p. 416).

Thrombus of the Vulva

May be in either labium, or in both. It is most frequently caused by the efforts of parturition; but may also follow external violence, efforts at stool, &c. Persons affected with varicocele of the labia are predisposed to the affection. The thrombus may attain to very large size, so as, in the case of parturition, to prove an obstruction. In such circumstances, the treatment consists in making a free incision, evacuating the blood and coagula, and restraining hemorrhage by pressure; with or without stuffing of the wound. In the case of accidental wound risk by hemorrhage is great.

If the tumor is small, it may cause no uneasiness; and requires no treatment, except the use of cooling and discutient lotions, with rest.

CHAPTER XXXVII.

AFFECTIONS OF THE FEMALE GENITAL ORGANS.

THE affections included in this chapter are considered very briefly, the great majority belonging to the exclusive province of the obstetric practitioner.

Inflammation of the Vulva

Occurs at all ages. In the adult, it presents no marked peculiarity in its history or treatment.

In the child, it forms the disease generally called infantile gonorrhœa, or infantile leucorrhœa. This affection, which was long mistaken for the result of attempted impure connection, may occur at any period of adolescence. It is most frequently seen in delicate, unhealthy children; and more among the children of the lower than of the higher classes. Not unfrequently it comes on during convalescence from the eruptive fevers, or during teething (p. 522).

Sometimes no cause can be assigned; or it may be induced by worms or other rectal irritation, by want of cleanliness, or by exposure of the parts to damp and cold.

The symptoms are, constant irritation and pain, so that the child is frequently moving its hand towards the part; pain and scalding in making water, to which the calls are sometimes inordinately frequent; and, in addition, the ordinary signs of slight febrile excitement.

On inspecting the pudenda, they are found bathed in pus; the whole surface of the vulva is swollen, red, and tender; and there is frequently, on and around the vulva, an eruption of a few red and inflamed spots, which may either disappear, or go on to form small pustules.

Treatment is simple. In mild cases, nothing but cleanliness may be required. In the more severe, it is necessary to exhibit laxative and alterative medicine, to keep the patient in bed, to allay feverish irritation by hot bathing, to apply locally hot fomentations at the outset, and subsequently to use various washes—as a weak solution of nitrate of silver, or of sulphate of zinc. The decoction of poppies is often useful to remove irritation. If the skin is broken, care must be taken, during the healing, to prevent cohesion of the labia.

Sometimes the disease affects children along with a low form of fever; and the inflammation may go on to sloughing. The vulva is also sometimes the seat of extensive and unhealthy ulceration, and of *noma*, with accompanying fever of a low typhoid character.

camphor and chalk powder in equal parts; or calomel—to dust on the part. Simple iced water; or very warm water; or infusion of tobacco, with borax or carbonate of soda added; or Goulard's lotion; or decoction of poppies, with sugar of lead; or a weak solution of nitrate of silver; or camphor mixture, with carbonate of soda; or diluted hydrocyanic acid, or solution of borax with sulphate of morphia—as lotions. Among ointments, the diluted citrine, the mercurial, the hydrocyanic, the sugar of lead, are recommended; as also borax and honey.

Malignant Ulcer of External Parts

Occasionally shows itself. It is recognized by the ordinary characters of malignant ulceration, and demands the ordinary treatment. Early and wide removal is the only remedy.

Sometimes the labia are found enlarged, and more or less extensively and deeply ulcerated; forming a disease which, from its intractability, may well be called malignant; although it has no other character of a cancerous sore. Strong caustics may succeed in producing healing action; but if not, the knife must be resorted to.

Tumors of the Labia.

In the Labium, fatty tumors are the most common; easily removable by the knife. Simple enlargement sometimes takes place in one labium, or in both; constituting a tumor analogous to the Elephantiasis Scroti of the male (p. 584).

Encysted tumors occasionally form; when of small size, removable by incision, and evulsion of the cyst; when large, to be dealt with by regular dissection. Hernial tumors, be it remembered, are also met with in the labium; recognizable by the ordinary signs, and amenable to the ordinary treatment. Varicocele is also common in this situation (p. 94).

Hypertrophy of the Clitoris and Nymphæ.

These parts are liable to simple enlargement. Ordinary cases require no remedial interference. But it may happen, that the swellings are not only inconvenient by their bulk, but also of a suspicious character as regards malignancy; and, in such circumstances, removal by the knife may become necessary.

A Red Fleshy Excrescence in the Orifice of the Urethra

Is productive of intense suffering, on account of the part's extreme sensibility to the urine, and to all external influences. It is easily made to bleed, and is generally about the size of a pea; sometimes as large as a small hazel-nut; usually at the verge of the canal, partially projecting, but sometimes also prolonged upwards into the urethra; and sometimes it forms a complete circle surrounding it. The only remedy is by excision; or by simple ablation, followed by the use of an escharo-

tic to repress growth. During healing of the wound, the nitrate of silver is of much use in restraining inordinate sensibility; applied lightly, every alternate day. But the growth is apt to reappear; again demanding treatment.

Laceration of the Perineum.

This is a casualty of parturition; the parts tearing down towards the anus—perhaps with implication of the bowel. The wound is kept clean, and approximation is effected and maintained by adduction of the thighs. By and by, the healing process is stimulated by medicated water-dressing. If necessary, the unclosed portion, having had its edges made raw by the bistoury, is brought together by means of the quilled suture—the form of suture found most suitable, in almost all cases of solution of continuity in these parts. Suture in the recent state of the injury is quite improper; and should in fact be long delayed, as nature generally makes sufficient reparation.

[After the closing of the wound by the quilled suture, it will often be found that the edges are subjected to considerable tension, and the sutures dangerously strained. Under such circumstances the expedient of Dieffenbach will be found an important addition to the ordinary operation. It consists in making an incision on each side of, and parallel with the wound, at the distance of half an inch, more or less, from its margins, and deep enough to relax the strain upon the sutures. These incisions will close by granulations, and the original wound having been pared, will be more likely to unite by primary adhesion.—Ed.]

Vaginal Fistula.

Of this there are three varieties: Vesico-vaginal, Urethro-vaginal, and Recto-vaginal; all the result, usually, of accident in parturition. By an unskilful use of instruments, the parts are torn; or, they are subjected to prolonged and severe pressure by the child's head, and sloughing consequently ensues.

Vesico-vaginal Fistula denotes an abnormal communication between the vagina and bladder. During parturition, the parts suffer irrecoverable injury. Shortly afterwards a slough may separate; if the urine have not been previously discharged, a gush follows; and afterwards, a draining away of that fluid remains; or there may be a discharge of urine, per vaginam, from the first. The patient is in constant discomfort and suffering. In spite of every attention, congestion and excoriation of the external parts ensue; and if constant diligence is not applied to maintain cleanliness both of person and dress, the patient's proximity may be noisome to others. As the chasm closes, the discharge diminishes. In some rare cases, spontaneous closure may be complete. In the great majority, an aperture remains; sometimes such as will barely admit a common director; sometimes a loathsome chasm, admitting several fingers. The aperture usually is in the mesial aspect behind the origin of the urethra. It can be felt by the finger; and may be disclosed by the bivalve speculum; or flat copper spatulæ may be used to hold

aside the walls of the vagina. In consequence of this canal having suffered other injuries, it may become distorted and irregular; and the discovery of the fistula, if small, may in consequence be very difficult. Detection is effected by placing a metallic catheter in the bladder, and examining the septum upon the catheter by a finger introduced per vaginam; or a probe may be passed from the vagina through any sinus, till it come in contact with the catheter. The existence of this abnormal state does not necessarily prevent reimpregnation.

Treatment, palliative or radical, should be commenced as soon as possible after the discovery of the disease. The former consists in taking measures calculated to prevent the constant and involuntary discharge of urine; the latter implies an attempt to close the abnormal aperture of communication. It is quite possible to dilate the vagina; to expose the injured parts; to pare the edges of the opening by a bistoury *in situ*, or after bringing them externally by traction with the volsella; to effect approximation by suture, by means of such instruments as are employed in staphyloraphé; and to leave a catheter in the urethra, so as to conduct off the urine before it distends the bladder. Sometimes, however, the catheter cannot be tolerated; and then the prospect is less hopeful. All this can be done, with difficulty to the operator, and pain to the patient; but a successful issue is extremely improbable. The ligatures may remain *in situ* even for two or three weeks, and all the urine be naturally discharged for that time, without adhesion of the edges of the wound having been effected. And so discouraging has been the result of such attempts hitherto, that many surgeons are agreed in the propriety of treating most cases of severe Vesico-vaginal Fistula by palliative means alone. The minor cases are remediable by simpler procedure; the occasional use of heated iron. The part is exposed by means of curved wooden spatulæ, or by an ivory speculum with an aperture in its side. If a metallic speculum is used, the cautery must be handled with care, so as not to touch the instrument. The iron, at a white heat, is accurately applied to the aperture; and, at long intervals, the application is repeated. The judicious operator, who wisely seeks only the remote, cicatrizing, and puckering effect of the burn, will seldom, if ever, make the interval shorter than three weeks; and often a much longer period may be found advisable. At the same time, all avoidable exertion is abstained from, the recumbent posture is maintained as much as possible, the vagina is temporarily occupied by a sponge or other plug, cleanliness is much attended to, and the marital use of the parts must, of course, be utterly abstained from. Mere fistulæ are quite curable in this way. And in the case of any opening, not of larger size that what is barely sufficient to admit the end of the little finger, cure may be thus attempted. In small fistulæ, the application of lunar caustic every three or four days is occasionally effectual.

Palliative treatment consists in the use of the adjuvant means just mentioned; occupying the vagina by a restraining plug; attending to cleanliness; preventing filth, fetor, and excoriation. Probably the best means of occupying the vagina is by a piece of sponge, repeatedly changed; or by a pyriform caoutchouc bottle of moderate size; enveloped in a piece of oiled silk; introduced in a state of collapse, and

then inflated by means of a nozzle and stopcock—or by means of such a valve as is used in air-tight cushions. Thus accurate compression is made on the aperture, so as to prevent escape of urine; and both comfort and cleanliness are obtained. The bottle is withdrawn daily, the air being previously permitted to escape; at the same time, the vagina may be cleared of accumulated secretion by means of a syringe, and fetor may be removed by a solution of the chlorides. The bottle, having been cleaned, is replaced.

Immediately after the occurrence of the accident, something may be done to favor spontaneous contraction of the aperture, and perhaps spontaneous cure. The patient is directed to lie as much as possible on her face; a catheter is constantly retained—being removed only for the purpose of being cleaned; a sponge, or some dressing, which must be changed with great gentleness, is placed in the vagina, of sufficient size to exert a moderate closing pressure on the injured part—so as to prevent cohesion of the wound to the walls of the vagina, with consequent complication of the case. Unfortunately, however, the catheter cannot, in all cases, be tolerated, and consequently the benefit of this plan of treatment is lost. The bowels are kept gently open, so as to preclude the necessity of straining.

[Much attention has been devoted, in this country, to the treatment of vesico-vaginal fistula, and it is believed that unusual success has been gained, particularly by Dr. Hayward, of Boston, Dr. Mettaüer, of Virginia, and Dr. Sims, of Alabama. Dr. Hayward is stated, by Dr. Sims, to have performed the first successful operation in the United States, for this affection.

Dr. Hayward's operation consists in introducing a large bougie of highly polished whalebone, through the urethra into the bladder, by means of which the posterior wall of the bladder is depressed by an assistant, and thus the fistula brought into view. The margin of the orifice is pared by scissors or knife, and the mucous membrane of the vagina dissected up from its connections to the extent of about three lines. This latter step was taken in order to gain a larger surface for union to take place, and partly to obviate the necessity or the liability of passing the sutures through the bladder. Finally, a needle, holding a thread, was inserted through the mucous membrane of the vagina and the subjacent cellular tissue, at about a third of an inch from the edge of the fistula, carried across the latter, and brought out upon the opposite side through the mucous membrane of the vagina and the cellular tissue, at about the same distance from the margin of the orifice at which it was first introduced. Three such sutures were passed, and then tied, or more if necessary.

For the operation the patient is placed as for lithotomy, and etherized; afterwards, she is allowed to lie upon the side, and a catheter is retained in the bladder for a few days, being removed sufficiently often for cleansing; but later, it is only introduced every three hours to remove what urine has collected.

Dr. Hayward has thus operated *twenty times* on nine patients; on one patient *six* times, on another *five* times, on two twice, and on five

once each. Of these, *three* were entirely cured; *five* were relieved, and *one* was not benefited.[1]

The operation of Dr. Mettaüer does not differ materially from the preceding, excepting that the mucous membrane of the vagina is not raised around the fistula, and the sutures are made of fine leaden wire instead of thread. These wires are left hanging from the vagina, and on the third, and again on the seventh day, the sutures are tightened (*Am. Journal*, July, 1847).

Dr. Sims has contributed to the *American Journal* for January, 1852, a very interesting paper on this subject, in which all the different steps of his operation, and the instruments he employs, are fully described, and illustrated with numerous drawings. There are several peculiarities in Dr. Sims's procedure which are worthy of notice, although the details are too numerous to be introduced here.

Instead of placing the patient upon her back, as is recommended by most operators, Dr. Sims places her upon her knees, the nates being elevated, and the head and shoulders depressed; the vagina is then opened, and the recto-vaginal septum elevated by means of a peculiar "*lever speculum*" held by an assistant. Sometimes, where a particularly strong light is required, the sunlight is made to fall upon a small mirror, so placed as to throw a bright reflection upon the part to be examined.

The margin of the fistula is pared, as in other operations, the instruments used being, however, somewhat peculiar.

The most distinctive feature in this proceeding, is the kind of *suture* employed. The thread is of annealed silver wire as fine as horsehair. It is introduced at about half an inch from the edge of the opening, pushed deeply into the vesico-vaginal septum, without entering the bladder, however, and brought out just at the edge of the mucous lining of the latter, at the margin of the fistula; it is then carried across the chasm, and thrust through the vesico-vaginal septum, in the same manner as before, reappearing at the same distance from the edge of the fistula. This is accomplished by the use of several instruments, very simple, yet very advantageous. After as many wires are passed as are considered requisite, at proper distances from each other, they are tightened by *clamps*, so that Dr. Sims terms this suture the "*clamp suture.*" A solid leaden rod, a little longer than the fistula, and a line in diameter, or an equally small silver tube, perfectly smoothed and polished, is perforated at the proper distances by holes through which the silver suture wires are passed, and secured either by twisting around the bar, or by being passed through small perforated shot, and bent firmly over; thus the distal ends of the wires are secured. The proximal end of each wire is then, in the same manner, passed through its appropriate hole in another similar bar, which is introduced into the vagina, and placed parallel with the proximal margin of the fistula: the bars are approximated as closely as is deemed advisable—not too closely, lest strangulation be induced—and the ends of the wire are secured as in the first case, and cut off.

[1] American Journal Med. Sci. vol. xxiv. 1839; Boston Med. and Surg. Journal, April, 1851.

On the third or fourth day after the operation, an examination is made to ascertain the condition of the parts, and again on the sixth or seventh day; if the sutures are not producing any unpleasant effects they are allowed to remain until the ninth or tenth day.

In order to prevent any injurious action of the urine upon the wound, Dr. Sims retains in the bladder a silver catheter of a peculiar form, so shaped, indeed, that it maintains itself in the bladder, without any retentive means being necessary.

The recumbent posture is to be strictly maintained, and the catheter is to be worn, for at least fifteen days, when Dr. Sims usually finds that the orifice has become pretty firmly closed. The bowels are not permitted to be moved, and, to secure their quiescence, opium is used as freely as may be necessary.

A variety of vaginal fistula, not enumerated in the text, is the *vesico-uterine*, in which the urine passes into the uterus, through a fistulous orifice in the bladder, and thence into the vagina.

This affection seems to have been first pointed out by Madame Lachapelle, and subsequently more clearly by Stoltz, of Strasbourg; more recently still, M. Jobert (de Lamballe) has given it a prominent place in his *Traité des Fistules*, Paris, 1852.

The *seat* of vesico-uterine fistula is in the posterior wall of the bladder and the corresponding part of the neck of the uterus, above the attachment of the vagina. Generally, it is below the point of peritoneal reflexion, involving the latter membrane only when higher up and more extensive than usual. Ordinarily, too, only the anterior wall of the cervix uteri is implicated; but it has happened that the cause which has produced the anterior orifice has also acted upon the posterior wall of the uterine canal, inducing sloughing there, and thus permitting the urine to pass from the bladder directly through and across the cervical canal of the womb, into the peritoneal cavity behind the latter, forming a double fistula, a *vesico-uterine* and *utero-abdominal;* this was the condition in the case published by Stoltz. (See Jobert, *Traité*, p. 14.)

The fistulous orifice is sometimes round, sometimes irregular; and occasionally it is lined by a firm membrane. The os uteri may be healthy, but is more commonly partially destroyed; the canal of the cervix is red and vascular, sometimes studded with indurations.

The *cause* of this accidental communication is unusual and long continued pressure of the child's head, in parturition, due either to the large size of the head, or to deformity of the pelvis; or, again, to the unskilful use of instruments, or to pressure of fragments of bone after craniotomy.

The *sign* by which the accident may be recognized is, the constant escape of urine by the vagina, when the patient is recumbent, and its partial flow when she is standing. But the detection of the site of the fistula is not easy; the speculum alone is not sufficient to betray it, for though the urine may pass into the speculum seemingly from the uterus, it can only be proved to come from the uterine cavity by alternately opening and closing the os uteri, by injecting fluid into the bladder, and observing its free exit from the cervix, by, if possible, passing a

sound into the bladder, and meeting it with one introduced through the os uteri.

The *treatment* is a matter of great difficulty. Caustics cannot be relied upon, partly on account of the situation and functions of the parts implicated, partly because of the great loss of substance which has occurred. The employment of the knife and suture, therefore, can alone be trusted for the radical cure.

In the use of these means, M. Jobert has certainly displayed much originality in device, and boldness in executing. One difficulty, indeed the first, to be overcome, was the concealed situation of the fistula, and the consequent obstacle imposed upon any inspection. In order to surmount this, M. Jobert diligently examined the connections of the parts in the subject, and satisfied himself that the neck of the uterus might be pretty freely divided *laterally*, in the direction of the commissures, without danger of wounding the peritoneum. This division may safely be extended as high up as the attachment of the vagina, but it ought not to be continued much above this point. The uterine artery was not divided in M. Jobert's experiments when the incision was limited as recommended.

The operation, then, which he advises, consists in making a section on each side of the neck of the uterus, in the line of the lateral commissures; the division being carried high enough up to enable the operator to gain a good view and command of the vesical fistula, which is to be sought for at the point where the bladder rests upon the anterior face of the neck of the uterus. The best instrument for dividing the neck of the womb, is a pair of strong, blunt-pointed scissors, the os uteri having been previously seized with two pairs of claw-pointed forceps, and drawn down towards the vaginal orifice, where it is held by an assistant. The neck of the uterus having been divided, two flaps are thus made, an anterior and a posterior. The former is thrown forward and upwards, and the fistulous opening is consequently exposed to view; its edges are now paired by means of a scalpel, and then are brought into accurate apposition, and retained in contact by sutures.

If this simpler operation proves effectual, and the fistula remains closed, well. If not, or if from any cause the edges cannot be properly approximated, then M. Jobert has another resource to fall back upon. He makes raw the surface of the canal of the cervix uteri from the lower margin of the fistula downwards, then brings together the two flaps of the neck previously made in the performance of the first operation, and retains them in apposition by three sutures, one on each side, and one in the middle. Thus, the communication between the uterine cavity and the vagina is completely cut off, and the menstrual blood will pass into the bladder at each monthly period. During the treatment after either operation, a catheter is retained in the bladder, until the urine manifests a disposition to pass naturally; or, if the bladder be too irritable for this, the water is frequently removed by the instrument.

M. Jobert reports a case in full, in which the first operation was successfully performed. The text is illustrated by wood-cuts, so that the steps of the operations are easily followed.

Another variety of the affection is the *vesico-utero-vaginal*, produced by the same cause which induced the preceding, but differing from the other in that the destructive process has attacked the vagina, at the point of its connection with the uterus, as well as the neck of the uterus. The loss of substance may be so great that nothing but a vestige of the neck of the womb remains, while the whole anterior wall of the vagina is wanting. Abnormal adhesions not unfrequently exist, the result of inflammation, so that the uterus cannot be drawn towards the ostium vaginæ, and the usè of instruments is very much interfered with.

The principle of the operation which M. Jobert recommends for this deformity, is the same as that already detailed. He pares the edges of the fistulous communication, and also that portion of the neck of the uterus which remains, and unites them together by sutures, at the same time making various incisions into the vagina and adventitious membranes, of such forms, and to such extent, and in such situations, as to allow the parts to yield, so that no tension or strain comes upon the sutures. The latter are passed pretty deeply through the substance of the tissues, and are withdrawn on the fifth or sixth day. Thus, the neck of the uterus, or that portion of it which has escaped destruction, which is generally but the posterior wall, is made to assist in closing the gap like a flap, and consequently the communication between the uterine cavity and the vagina is cut off, the catamenial exudation escaping from the former into the bladder.

M. Jobert reports, in full, four remarkable cases, illustrative of the different steps in this complicated procedure; of these, three were entirely cured, and one died of peritonitis, on the fifth day after the operation.

An important element of success in all the operations practised by M. Jobert, consists in the liberating incisions which he makes in the parts near the points of sutures, so as to prevent any strain or traction upon the latter.—Ed.]

Urethro-vaginal Fistula denotes a preternatural communication between the vagina and the urethra; caused, probably, by the imprudent use of instruments. In general, the same disagreeable results occur as in the former case. Sometimes there is power of retention; but, in evacuating the urine, it trickles through the vagina, and over the limbs. The treatment is the same, but more frequently successful.

Recto-vaginal Fistula.—Laceration of the septum between the vagina and the bowel takes place, by the rash use of instruments, or by tearing in the natural efforts of parturition, or as a consequence of sloughing from pressure. In the latter case, the perineum usually suffers laceration also. The parts are to be kept clean and quiet; and spontaneous diminution of the chasm is favored by every possible means. When the fistulous condition has been arrived at—that is, when the margins of the tear have healed, and contraction has ceased—the parts are exposed, by means of a speculum, if necessary; the edges are made raw by paring, and approximation is effected by means of the quilled suture (*Principles*, 3d Am. Ed. p. 602). The parts, in this case, being comparatively superficial, the operation is performed not only with comparative ease, but

also with a good prospect of success. If the aperture is small, it may be treated by caustic or cautery, like the vesico-vaginal fistula.

[In a case of Recto-vaginal Fistula, which had been but partially closed by suture, Velpeau performed a *plastic* operation. The flap was cut from the left labium majus, and drawn, by a thread attached to its upper extremity, through the vagina into the fistula in the rectum, where it was fixed. It mortified, however, in two-thirds of its extent, so that the fistula was diminished only by one-third of its size. M. Velpeau remarks upon the operation, "that in patients more tractable, and by taking every possible precaution not to weaken the vitality of the flap, elytroplasty by the tegumentary plug will offer some prospect of success in this kind of fistula." (*Mott's Ed. of Velpeau*, vol. i. p. 673.)

Dr. Barton, of this city, succeeded in curing a case of Recto-vaginal fistula by *seton*, as follows: The thread was passed into the vaginal orifice of the fistula, along the track of this false passage into the rectum, and out at the anus; then the vaginal and anal ends of the seton were tied; after a few days, the vaginal thread was carried, by means of an eyed probe, suitably bent, into the fistulous orifice, and down between the vagina and rectum to the perineum, where an incision was made, through which the probe and the ligature were withdrawn. Thus, the anterior wall of the rectum was included within the loop of the seton, which was tightened from day to day, until the ligature cut its way out, as in an ordinary case of fistula in ano treated by ligature. So soon as the new fistulous passage became larger than the old, the feces and gas, which before had escaped by the latter, now took the former route, and the abnormal opening into the vagina was readily closed. (*Am. Journ.* vol. i. 1840.)

Dr. Mott, of New York, has performed a similar operation for this affection. In these cases the fistula was small, and the rectal orifice considerably higher than the vaginal.

M. Jobert, having, without satisfactory success, tried the method by cauterization, by seton, by flaps brought from neighboring surfaces, as in M. Velpeau's case, has in his last work, already cited, exposed a much more simple and successful plan, which is suited to all cases, especially to those in which the fistula is large from loss of substance of the parts; these being, he thinks, beyond relief by the other means proposed hitherto.

The patient, after having undergone a proper preparative treatment, is placed on her back, as for lithotomy, the knees being supported by assistants; the vulva is fully opened, and the Vesico-vaginal Septum well raised up by means of a uni-valve speculum. Then, the fistula being clearly exposed to view, its edges are pared and brought closely together by a sufficient number of tolerably large, waxed-thread sutures, to prevent any escape of air or feces from the rectum. The last, and a very essential step, consists in making such incisions through the mucous membrane of the vagina, as shall prevent all straining upon the sutures; constituting, in fact, a species of autoplastic operation, which M. Jobert terms, "*autoplastie par glissement, on par locomotion.*" The number of these incisions must depend upon the mobility or fixed-

ness of the tissues; the precise sites to be selected for them must be determined by experiment in each case; they may be longitudinal, transverse, semicircular, or in all of these directions, as seems best adapted to produce the desired effect.

The sutures should be allowed to remain eight or ten days, unless they should produce bad effects sooner. The bowels should be kept confined, and the recumbent position strictly maintained.—ED.]

In the advanced stages of cancer of the female organs, these fistulæ frequently are produced by malignant ulceration of the septa. Of course, in such cases, no surgical treatment is admissible.

Stricture of the Vagina.

This may be the result of previous inflammation, indurating the mucous and submuceus tissues of a part of the vagina; or it may follow on the healing of a wound received during artificial delivery, or otherwise; or it may be consequent on ulceration produced by a badly arranged pessary. Finally, it may be the result of cancerous deposit. Under ordinary circumstances, it is amenable to the same treatment by gradual dilatation, as contractions of other mucous canals. But the surgeon's aid is seldom called for, except during the crisis of parturition; the progress of the child having become obstructed, by an unyielding contraction of the vagina—usually situated at the upper part of the canal, and usually the result of a previous unfortunate labor. The duty of the surgeon is, by a probe-pointed bistoury, introduced on the finger, to notch the contracted part at various points; and then, by progress of the child's head, or by the finger of the operator, dilatation is effected.

Obliteration of the Vagina,

To a greater or less extent, is occasionally met with; arising from the same causes as stricture. Then much constitutional disorder must result, from arrest of the uterine discharges; and it is desirable to restore the canal, at least to such an extent as to admit of a due performance of the excretory functions of the organ. The knife, or the trocar, is used, guided in a normal direction by the finger in the rectum; and the passage made is kept dilated, by means of tents or bougies. If the patient has ceased to menstruate, no operation may be required.

Imperforate Vagina or Hymen.

The vagina may seem well formed externally; but, on examination, may be found terminating in a blind *cul-de-sac*, at no great distance from the orifice. In such a case, no exploratory incision is warrantable, in search of the uterus, in the adult; unless, on careful examination, by the rectum and otherwise, there is a tolerable certainty of that organ being present.

A more frequent imperfection occurs at the orifice; the other part of the canal being well developed, and in a normal state. The membrane of the hymen may be excessive, and imperforate; or the vagina itself

may be shut up, by a more solid and fleshy structure. Interference is not necessary, and, indeed, the malformation may not be discovered, until about the time of puberty; and then, on account of non-appearance of the menstrual discharge, and the persistence of uneasy sensations in the pelvis and parts affected, attention is directed to the state of the genital organs. The obstructed fluid may be found bulging through a thin membranous septum; or there may be but a vestige of the normal opening, and solid flesh beneath, devoid of bulge or fluctuation. In the one case, simple division of the membrane suffices to establish the normal state. In the other, careful incision is required, as in the case of imperforate anus; and the same necessity exists, for afterwards maintaining the proper caliber of the part by suitable means Immediately after incision, it is well to insure thorough evacuation of the pent-up fluid; washing out the vagina with tepid water, by means of a syringe.

In cases of this kind, the accumulated menstrual fluid may fill and dilate not only the vagina but also the uterus, expanding the latter as in pregnancy, and causing even some of the equivocal symptoms of that state. The operation of evacuation is not without danger, especially if performed in hospitals; the dangers being by purulent fever and phlebitis. The fluid evacuated is generally dark red, or mahogany colored, very viscid and grumous; but these characters vary.

Sometimes, adhesion of the nymphæ takes place in children; the opposed surfaces having become raw, on account of neglect of cleanliness, or in consequence of these parts suffering in sympathy with disorder elsewhere, and a purulent discharge having become established (p. 591). In general, the cohesion is slight, and easily broken up by means of the flat end of a probe. For some days, interposition of dressing is necessary, to prevent reunion.

Foreign Bodies in the Vagina.

These may be introduced by the patient herself, under some morbid excitement; or, violently and criminally, by a second party. And they may be of such bulk, or so impacted, as to resist the ordinary means of extraction. By dilatation and lubrication of the passage, and by the judicious use of forceps or lever, dislodgement may be effected, without injury of the parts. In difficult cases, division of the impacted substance, or, if that is impracticable, of the sphincter, may be necessary. as in the analogous case of the rectum (p. 429).

Prolapsus of the Vagina

May exist in various degrees; the dislocated part still remaining in the vaginal cavity, or protruding from it at the vulva. It may be partial or complete. Partial prolapsus consists in the falling down of a part of the vagina; generally, either of the anterior (vaginal cystocele), or of the posterior wall (vaginal rectocele). Complete prolapsus resembles prolapse of the bowel per anum; the whole circumference of the vaginal tube descending. It is distinguished from prolapsus of the uterus,

by the anatomical characters of the mucous membrane of the vagina, and by reaching the os uteri with the finger passed through and above the swelling.

It is generally accompanied by a feeling of much weight and uneasiness; and often there is considerable irritation with discharge. The functions of the bladder and rectum are more or less impeded or deranged; and if the dislocation has been suddenly produced, there may be obstinate constipation and strangury. It is a complaint extremely obnoxious to the female; not only causing uneasiness or pain in sitting or walking, but often exciting unjustifiable alarm.

The affection is most common in women who have borne many children, or suffered frequent abortions, or who labor under menorrhagia or aggravated leucorrhœa. In short, anything which tends to relax the parts involved, favors its occurrence; not forgetting the influence of deranged general health, and feeble constitution. It may be caused suddenly and kept up by any violent effort, as in coughing, sneezing, laughing, lifting a heavy weight, or straining at stool.

Sometimes removal of the exciting cause—with or without the use of cold and astringent lotions and general tonics—is sufficient to effect a cure. The wearing of an understrap is often beneficial. Sometimes a pessary, in shape adapted to the parts, is enough. But if the case prove incurable and cause much annoyance, it may be dealt with by the knife, as in prolapsus ani—special care being previously taken to ascertain the relations of the bladder and rectum to the parts to be excised. If either of these organs come in the way of the incisions required, of course no cutting is at all admissible.

The passing of the Female Catheter.

In this operation, much delicacy is required. When, from prolapsus uteri, or other causes, there is much relaxation or change of relative position, ocular inspection may be necessary. But, in ordinary cases, all is done by touch alone, under the dress or bedclothes. The patient should be in the recumbent position, with the nearer thigh flexed. If the surgeon is at the left side of his patient, the fore-finger of the left hand, if on the right side the fore-finger of the right hand, is passed to the upper part of the orifice of the vagina, which is distinguished from the vestibulum by its rugosity; the catheter is placed about an inch over this—and, by moving the point downwards, in the mesial line, it slips into the orifice of the urethra. Or, the finger is moved in search of the urethral orifice; which is recognized by feeling a depression, with an elevation on its vaginal aspect; and, along the finger, the catheter is then directly introduced. When there is displacement of the parts, a common elastic catheter may be found more suitable than the silver instrument; as then there may be both twisting and elongation of the canal. The ordinary silver catheter should be flat, very slightly curved, about six inches in length, and having some projection or knob on its outer orifice, to prevent its slipping into the canal altogether.

[The editor has found the following directions to be more easily followed: Introduce the tip of the fore-finger into the upper part of the orifice of the vagina, so that its palmar surface is gently pressed against the pubic arch; if now the point of the finger be thrust slightly forward, it will feel directly the orifice of the urethra. The catheter should be introduced upon the point of this finger, either by the left hand, or, after a little practice, with the disengaged fingers of the right hand. Sometimes the orifice of the urethra is dragged somewhat downwards, as in prolapsus uteri; or drawn upwards and behind the pubic arch, as in pregnancy, and intra-pelvic tumors connected with the uterus. In such cases, a little more difficulty will be experienced in discovering and entering the canal.—ED.]

Plugging of the Vagina

Is a most useful and important operation, as a hemostatic, when flooding (not *post partum*) has to be arrested. In every form of hemorrhage from the vagina, it may be of the greatest service; and often is in fact the means of saving life. The simplest and most convenient method of plugging is to use pieces of sponge, or lint, or linen; placing them in the vagina one after the other, every piece being lodged as high as possible. When the bleeding is passive, not many pieces may be required; but if vessels have been opened by operation, the plugging must be done very efficiently; the vagina being well crammed, and a T bandage applied to support the pledgets, which may be previously saturated with vinegar, or solution of matico, or other astringent and styptic lotion. Great care must be paid to watch against return or persistence of the discharge; and the plug should be carefully removed at the end of about twelve hours; to be replaced, if necessary, with new materials.

Another plan, not so easy of execution, is to pass the centre of a napkin into the vagina; thus making a blind pouch there open from without, and into which the necessary amount of stuffing may be passed. Or, a bladder may be passed and inflated with air, or with refrigerant solutions. Or the same may be done with bags of vulcanized caoutchouc; and some ingenious instruments have been constructed for the purpose.

Leucorrhœa

Is a nosological term, used to indicate a state of disease having discharge of a mucous or muco-purulent character from the vagina as its most prominent phenomenon. Apart from its occurrence as a symptom of almost all the more serious uterine affections, it is the most common of female diseases; and occurs in a great variety of forms.

The *discharge commonly called* "*Whites*," may exist without any defined disease in the vagina or uterus, and may be the result of general debility and relaxation of system, especially if in a scrofulous constitution; or it may occur during amenorrhœa. Occasionally, it supervenes after the manner of a common catarrh. Often, also, it is a persistent excess of secretion *post partum*.

In such a case, if examination be made by the speculum, no organic lesion may be discovered. Sometimes, however, the mucous membrane of the cervix is found red and injected, or slightly abraded—especially if the case has been neglected, and allowed to run a protracted course.

In this, as well as in all other forms of leucorrhœa, the symptoms complained of by the patient may be either few or numerous. They are a class of symptoms common to all uterine affections; viz., disorders of the menstrual function; pain in the back and loins, in the hypochondria, across the hypogastrium, and down the limbs; feelings of bearing down and unnatural weight in the perineum; besides the ordinary accompaniments of disordered stomach and bowels. In most such cases, no local treatment is required. On the contrary, by causing excitement and irritation, it would probably aggravate the complaint. Cold sponging, or the cold hip-bath, with attention to the general health will suffice. The tincture of cantharides, and the various preparations of iron taken internally, often seem to have a good effect in diminishing the discharge.

If the case be one of *vaginitis, simple or specific*, there will, in addition to the other symptoms already mentioned, be those of febrile accession, along with much local pain, irritation of bladder, ardor urinæ, pain in defecation and in walking. The discharge will not be white and mucous, but muco-purulent. In such circumstances, vaginal examination will reveal a preternaturally red color of the mucous membrane, with much tenderness; and, in addition, there may be more or less excoriation, or superficial ulceration of the cervix. Treatment consists in maintaining the horizontal position, fomenting or poulticing the parts externally, and internally using a bland or sedative injection; besides employing purgatives and all the ordinary treatment of gonorrhœa (see p. 522).

After an attack of vaginitis, a disagreeable muco-purulent discharge may continue; or, by neglect, a simple white discharge may be aggravated to this character. But the most frequent cause of these leucorrhœal complaints, when they come to demand local treatment, is an *inflamed and ulcerated, or otherwise morbid state of the cervix uteri.* The disease may occur in an acute form, but is more frequently met with as a chronic complaint. The symptoms are severer than in the case of "whites," and the general health suffers severely. The discharge may vary much in quantity; it may also be of various consistence; it may be muco-purulent, or almost pure pus; and it may, or may not be tinged with blood. If of long continuance and profuse, it often causes much irritation of the labia externally. Sometimes it is complicated with displacement of the womb, or with chronic inflammation, or engorgement and hypertrophy of the whole organ; and these circumstances much retard the progress of cure. All women are liable to such complaints; but the married and childbearing suffer both most frequently and most severely.

In this brief sketch it is expedient to treat of the numerous morbid, non-malignant states of the cervix together; more especially when we consider that they cannot in any way be distinguished from each other,

without a tactile and visual examination of the implicated parts; and farther, that the treatment, in its general features, is similar in all. Passing over, with simple mention, the aphthous, herpetic, and other forms of integumental disease rarely observed, we notice *the simply inflamed and ulcerated cervix.* All the signs of inflammation are present; but the pain and tenderness may not be very severe. The part may be more or less indurated, and the degree of swelling varies. Sometimes the cervix acquires considerable bulk, is hard, and somewhat nodulated, and may cause some difficulty in diagnosis from cancer; the more especially as the weak, pallid, and cachectic appearance of the patient often appears to favor the notion of malignancy. It happens very rarely, however, that carcinoma of the uterine neck is actually mistaken for hypertrophy; for it is generally found, even on a first examination, to be in an advanced state. At the same time, it is to be remembered. that hypertrophy is not unfrequently mistaken for carcinoma; and sometimes even the most experienced find a difficulty in diagnosis, till the result of treatment has been ascertained. The following points are distinctive in most cases. In carcinoma, there is the peculiar cachexy of system; and the morbid deposit may extend from the cervix more or less over the roof of the vagina, rendering the uterus fixed in the pelvis. There is generally great induration; and if there be ulceration, the indurated points projecting into it are friable under the finger; the ulceration is deep and irregular in form; and the discharge is frequently fetid, and sometimes mixed with blood.

In inflammation of the cervix, the accompanying ulceration most frequently attacks the posterior lip. The ulceration may be of various kinds; simple or healthy, indolent, irritable, or weak (*Principles*, 3d Am. Ed. p. 233).

The cervix uteri is also liable to *a granular form of inflammation.* The part is tender, red, and having the mucous membrane abraded or superficially ulcerated, and bears numerous red points on its surface. Generally, it is also somewhat enlarged; and frequently, in this case. the vagina is irritated, or more or less inflamed around the cervix.

Sometimes, also, the cervix is found with *small nodulations* over its surface, apparently the result of inflammation in the glands of the part.

When the ulceration is healthy, and there exists no complication, it is easy to effect a cure, by enjoining rest of the parts, and using any simple detergent or mild astringent lotion. If it is protracted in duration, or unhealthy in its character, the lunar caustic may be used through the speculum, every third or fourth day; care being taken to secure its proper application, by cleansing the parts with a small sponge. or dossil of lint, previously. In all forms of inflammation of the cervix with ulceration, this is one of our most useful resources; and, in most cases, along with proper regulations as to rest of the parts, and attention to the general health, it is successful. If the ulceration prove obstinate, however, other means may be tried, as the sulphate of copper. nitric acid, the acid nitrate of mercury, or even the cautery. After the ulceration has been healed, it is generally necessary to continue the adjuvant treatment for a considerable time; and to check the leucor-

rhœa which may persist, a variety of astringent lotions may be used, as circumstances demand. Among these may be mentioned the simple douche of cold water, injected into the vagina for a few minutes, once or twice a day; the use of strong infusion of green tea, with some borax added, eight or ten ounces being injected morning and evening: the use of decoction of oak-bark in the same way, or of weak solutions of sulphate of zinc, alum, acetate of lead, chloride of zinc, or nitrate of silver in small quantity.

Sometimes the application of leeches internally, by means of a tube, is useful to dispel inflammation, and to remove local congestion. And the application of iodine in tincture through the speculum, or its use in the form of iodide of lead ointment introduced into the vagina, is often advantageous in dispelling engorgement.

The most intractable cases are those where the disease is chronic, and where there is more or less enlargement of the cervix. In these, there is frequently a degree of hypertrophy of the whole uterus, also often displacement of the organ; and although reduction of the size of the cervix, and arrest of the leucorrhœa, frequently remove the entire affection, there constantly recur cases where this does not happen and the symptoms of uterine disease persist. In such circumstances, the progress to cure is often tedious, and treatment must be directed to the engorgement and hypertrophy of the womb, and to the general health, simultaneously. In reducing the enlarged cervix, it is sometimes necessary, in addition to the means already described for the cure of ulceration, to resort to more heroic means. After destroying a part of the diseased tissues by means of strong caustics, absorption and disappearance of the remaining portion are induced. For this, various plans have been recommended; such as the careful application, through an ivory speculum, of a cautery at white heat. Thus a slough is produced, and a healthy ulceration may follow; the application afterwards being repeated or not, according to circumstances. The application of potassa cum calce has also been advised; but a more efficient and satisfactory plan is to apply freely to the most indurated part the potassa fusa, through a glass speculum; guarding the neighboring parts by irrigating them immediately and abundantly with dilute acetic acid strongly injected.

[Dr. W. Tyler Smith has recently made the subject of *Leucorrhœa* a matter of careful study, in connection with the microscopical anatomy of the os and cervix uteri. And his researches have thrown much light upon the diagnosis of the seat of this affection, and also upon its treatment. (See *Med.-Chir. Trans.* vol. xxxv. 1852.)

He has shown more clearly than any other observer, that there are important differences in structure between the vaginal portion of the cervix uteri and the canal of the cervix—differences which are associated with functional peculiarities. Without attempting to repeat at all, in full, the anatomical descriptions given by Dr. Smith, which would be out of place here, we will state the most important facts only.

The epithelium of the os and cervix uteri is of the tessellated or squamous variety, and forms a membrane of considerable thickness. It closely resembles the epithelial covering of the vagina with which it is continu-

ous. Just beneath this layer, the basement membrane is seen, covering numerous villi or papillæ which stud the whole surface. These villi vary in size; sometimes two or three are united together upon a common pedicle, generally they are single. Each one contains a bloodvessel which curves upon itself at the end of the villus, and returning to the base inosculates with the bloodvessel of the contiguous villus. No follicular structure can be distinctly made out.

Just within the os uteri a small tract of smooth surface exists, intervening between the mucous membrane of the exterior face and the peculiar penniform, rugose lining of the canal of the cervix uteri. The structure of this portion resembles that before described, excepting that the epithelium is of the cylindrical instead of the scaly variety, and the villi are larger; the arrangement of the bloodvessels of the villi is the same; and between the bloodvessels and the basement membrane numbers of large oil-globules are found, as well as small granular cells.

The cervical canal presents a very different appearance. Its internal surface is arranged in four rugæ or folds of mucous membrane, having an oblique, curved or transverse direction. Smaller folds are observable between these principal ones, with fossæ between them. This arrangement allows of great expansion of the mucous membrane in pregnancy and parturition; and it also affords a vast surface for glandular development. For over the whole area crypts and follicles are abundant; and besides, villi are scattered over the surface similar to those of the lower part of the cervix. The epithelium covering this follicular surface is cylindrical, and ciliated low down in the cervix.

The normal mucus secreted by the canal of the cervix is extremely viscid and almost transparent; it consists chiefly of mucus-corpuscles, caudate corpuscles, minute oil-globules, and occasionally cylindrical epithelium, all entangled in a thick tenacious plasma. It is *alkaline* in its reaction.

The normal mucus of the vagina and the vaginal surface of the neck of the uterus, is pearly and semitransparent, containing numerous curdy particles which, when in considerable quantity, give it a creamy appearance. It contains large amounts of scaly epithelium and epithelial debris. It is *acid* in its reaction.

From this view of the comparative complexity of structure of the vaginal and cervical mucous membrane, Dr. Smith contends that by far the larger proportion of the leucorrhœal discharge must come from the lining membrane of the cervical canal, from which the secretion becomes, from certain causes, incessant, instead of being pretty much limited to about the catamenial period. At first, the discharge is merely increased in quantity; but soon contains, besides, or instead of, epithelium and a few mucus-corpuscles and oil-globules, numerous blood-globules, pus-cells, and exudation-corpuscles, and in amount so great as to constitute a grievous drain upon the system. This constitutes what Dr. Smith terms the *Mucous or Corpuscular Leucorrhœa of the Cervical Canal.*

When the vagina and the external surface of the neck of the womb are the seat of the disease, the secretion is less abundant, and consists, so long as the surface remains unbroken, or is merely denuded of its

epithelium, of a plasma holding suspended multitudes of scales of epithelium, in every stage of formation from mere nuclei to the detritus of old epithelium. This variety Dr. Smith calls *Epithelial Leucorrhœa of the Vagina.* When the tissue beneath the epithelial layer becomes implicated, the discharge assumes characters which closely resemble those of the *cervical* leucorrhœal discharge.

The pathological condition of the mucous membrane in chronic leucorrhœa may be briefly stated as follows: the epithelium of the external portion of the os and cervix uteri may be partially or entirely removed, or removed in patches. The surface is then red, the vascular villi being exposed; the latter also are frequently enlarged, and they stand out more prominently, giving to the surface a velvety look and feel. In that condition of the os uteri, which would be called after death *superficial ulceration*, not only is the epithelium removed, but the villi also are partially or wholly destroyed in patches; the extent of these patches is of course variable. Thus, two grades or stages of alteration are found; the first may be termed *epithelial abrasion*, the epithelium being alone deficient; the second, *villous abrasion*, *erosion*, or *ulceration*, the villi, and even the base from which they spring, being affected by a superficial ulcerative process. Sometimes not only are the villi more or less destroyed, but portions of the rugæ of the cervical canal are eaten away.

In certain cases, what are called the *Ovules* of *Naboth* occur; these have been generally considered to be obstructed mucous follicles. Dr. Smith regards them as a form of vesicular disease, seated at first in the deeper structures of the mucous membrane. They are found where no mucous follicles exist, often. These vesicles are generally accompanied by a profuse discharge from the cervix, with a patulous condition and engorgement of the os uteri. They are found as high up in the cervical canal as the summit of the rugose columns. They ordinarily mature and rupture, leaving ulcers behind them. Sometimes they continue to enlarge without bursting; and Dr. Smith surmises that the vesicular polypi of the os and cervix originate in this manner; and that the solid polypi arise from enlarged villi.

After long-continued leucorrhœa, partial inversion of the lower part of the cervical canal takes place, giving rise to much pain, and exposing sometimes the rugose arrangement of the lining membrane. This condition has been considered a form of ulceration, called the "*cock's-comb*" granulation; the penniform rugæ are denuded of epithelium, and their villi are florid and enlarged; presenting, on the whole, some considerable resemblance to a *cock's comb.*

The *causes* of leucorrhœa may be, as stated by Professor Miller, vaginitis, local injuries, eruptive disorders affecting the parts. But, according to Dr. Smith's observation, the most common cause of *vaginal leucorrhœa* is the irritation produced by the morbid secretion from the canal of the cervix. And this effect he attributes to the fact that the discharge from the latter is *alkaline*, while the vagina is accustomed to the presence of an *acid* secretion. This he illustrates by reference to the effect of alkalies, long contained, upon the stomach; of alkaline urine upon the bladder; of the alkaline spermatic fluid upon the urethra.

Besides these local causes, some derangement of general health must also be supposed to exist.

The *treatment* of leucorrhœa must embrace both local and general remedies. But it is obvious, from the preceding considerations, that the local applications must be made to the internal surface of the cervix, as well as to the vagina and the vaginal portion of the neck. Injections are serviceable when the disease is confined to the latter situations; but when the cervical canal is affected, the remedies must be applied directly by a camel-hair pencil, unless the mouth of the uterus is widely open.

We have made these copious extracts from Dr. Smith's paper, in consequence of the novelty of the facts and the soundness of the deductions. The Memoir is accompanied by numerous beautiful drawings, and may be read with great advantage.—Ed.]

Inversion of the Uterus

Is the turning of the organ inside out; and it may happen in various degrees. It has been observed to occur idiopathically even in the virgin; and in a minor degree is probably a not unfrequent concomitant of polypus springing from the body or fundus of the womb. But the great majority of cases occur soon after delivery, in consequence of improper treatment after the birth of the child; and occasionally it happens spontaneously at this time. Into these details this is not the place to enter. It is sufficient to state that if the organ be not reduced very soon after the displacement has occurred, it will speedily become irreducible. If death do not quickly follow, the case becomes one of chronic inversion, which, inducing as it does large losses of blood, exhausting discharge, with rectal and vesical irritation, is the cause of constitutional disorder so serious as to suggest the propriety of completely removing the inverted organ. The statistics of the operation are not sufficient to found a decided opinion upon; but they are encouraging, when we consider the gravity of the complaint. The surgeon has to decide whether his patient's best chance lies in tolerating the disease and combating its effects, or in submitting to the risk of operation. On the one side, there is a grave disorder which frequently proves fatal, by exhausting the patient—if not more directly; and on the other, we have the favorable experience of numerous surgeons who have practised extirpation of the organ.

It is sometimes difficult to diagnose this affection from polypus; but in general it can be made out with great certainty. In inversion, we observe the absence of the body of the uterus from its natural position; a state of matters as easy to determine in the thin and relaxed female, as it is difficult under the reverse condition. There is a tumor in the vagina, sensible or even tender, and the handling of which is liable to induce sickness; it is rough on the surface, dark in color, easily made to bleed, regularly rounded in form, and with the base larger than any other part; or only moderately constricted, by the cervix; having little mobility; and occasionally, if prolapsed, showing the openings of the Fallopian tubes, into which a stylet may be introduced. If the finger is

passed above the inverted parts, it first reaches the cervix, more or less completely encircling the base of the tumor; and the finger or bougie, introduced between the cervix and the tumor, quickly reaches a *cul-de-sac* all round the latter. Farther, the history of the case is peculiar. The reverse of almost all these points is predicable of a polypus; and some of them, if certainly made out, are quite distinctive.

When inversion is partial and the result of polypus, it will probably disappear spontaneously on removal of the cause. In an ordinary case of chronic *post-partum* inversion, an attempt should be made to reduce it by direct pressure; premising the use of warm baths, local bleedings, purgatives, &c. If this fail, and extirpation of the organ is recommended, it is sufficiently easy of execution. The womb is drawn down between the labia by forceps, and a very tight ligature is applied around it below the cervix, care being taken that no intestine has descended into the inverted organ. Or the mass may be transfixed by a double ligature, and tied in two parts. Or a metallic ligature may be thrown around the mass; and by the aid of Gooch's double canula or other similar instrument, this may be gradually tightened till it cuts its way through and separates the mass. It occasionally happens that the already existing constriction at the neck of the womb is such as to cause sloughing without surgical assistance.

[In the thirty-fifth vol. of the *Medico-Chir. Trans.*, is a paper by Mr. J. G. Forbes, on Inversion of the Uterus after Parturition, with a tabular statement of the result of operations practised in thirty-six cases of the accident. The table is drawn up with much care, and presents many interesting facts.

The operations practised were by *ligature*, by *excision*, and by *excision after the use of the ligature*. The duration of the complaint previous to the operation, varied from one month to many years. The comparative proportion of the uterus removed, also varied in different cases.

1. Of those treated by *ligature* only, twenty-one were successful, five were unsuccessful. Of the latter, three died and two recovered without extirpation of the tumor, the severity of the symptoms induced by the ligature having necessitated the removal of the latter.

Of the three fatal cases, one died on the fifth day, the patient sinking after the operation; one from peritonitis on the twelfth day; one from peritonitis on the fourth day.

In the twenty-three patients who recovered, the operation produced violent pain, threatenings of peritonitis, or peritonitis itself, and more or less severe constitutional disturbance. The ligature, which was made sometimes of silk waxed, sometimes of cat-gut, annealed wire, &c. &c., separated with the tumor in from ten days to three weeks, generally in from fourteen to seventeen days. In some instances the catamenia reappeared after the operation.

2. Of the two cases treated by *excision*, one was successful, and one was unsuccessful. In the first, the patient was well in less than a month, after having been extremely ill during the first three days following the operation. In the second, the patient died in two days, of peritonitis.

3. Of the eight cases treated by *excision* and *ligature*, five were suc-

cessful and three unsuccessful. In the former, the symptoms following the operation were, of course, similar to those witnessed in the first series of cases. The patients were well in from four to six weeks. In one, a protrusion of intestine occurred after three weeks, through the broken up cicatrix; yet the patient recovered.

Of the three fatal cases, one died from hemorrhage and peritonitis, on the third day; one on the seventh day, with phlebitis or peritonitis, but with inflammation of the lining membrane of the ventricles of the brain, softening of their surfaces and of the central portions of both hemispheres, and slight extravasation of blood at these parts; in one, death followed in twenty-four hours from the shock of the operation.

In nine of these thirty-six cases, the tumor was mistaken for a polypus.

In a case of inversion narrated in full by Mr. Forbes, great advantage in arresting the periodical hemorrhage from the inverted womb, was derived from the close application around the tumor of strips of lint soaked in a strong solution of alum, conjoined with absolute rest in the recumbent position. During the intervals of the catamenial periods, good diet, gentle carriage exercise, chalybeates, &c., were advised. Under this treatment the patient's life was evidently prolonged; she died, however, at the end of eighteen months, exhausted by the large and repeated hemorrhages.—ED.]

Prolapsus of the Uterus

May be partial or complete, the former term indicating an abnormal approximation of the uterus to the os externum vaginæ; the latter denoting that the organ lies in part, or in whole, without the os externum, forming a tumor between the patient's thighs. The affection may occur at any age, but increases in frequency with the advance of life, as well as according to the number of labors. Small tumors in the uterus, or the pressure of large tumors upon it, menorrhagia and leucorrhœa, are local predisposing causes, as also relaxation of the vagina, from whatever cause, and largeness of pelvis. It is met with in every rank of life, but when in a very aggravated state is most frequent in the lower classes, especially in those unfortunate women whose avocations require much straining and effort, which not only predispose to the disease, but also aggravate it when it exists. It may occur at any stage of pregnancy, or through it all, and even during delivery at the full time, but this rarely.

This condition is easily distinguished by finding the os and cervix, and ascertaining that the former leads into the cavity of the organ. Partial prolapsus is extremely frequent in its occurrence, is easily replaced in most cases, and seldom causes any serious disturbance. In complete prolapsus, also, the tumor is often easy of replacement; sometimes, indeed, it resumes its natural position spontaneously, when the patient lies down. But in aggravated cases, replacement may be a matter of difficulty from various causes. Of these, congestion and inflammation, with their consequences, are the most important. In some cases this latter has been so intense as to end in gangrene and

separation of the parts, resulting in either death or cure of the patient. When the prolapsus is large and of long standing, it may be quite impossible to replace it. The uterus, carrying with it the bladder and rectum, becomes swollen and condensed, and forms a large pouch, containing other viscera prolapsed into it, in this state resembling an old and large hernia, the contents of which can with difficulty, if at all, find room for return to the abdominal cavity. In such cases, the protruded parts generally present large and unhealthy patches of ulceration, and the corresponding portions of the thighs are more or less irritated and excoriated.

Prolapsus of the uterus is generally the cause of much undefined suffering in the region of the pelvis. Patients complain of distressing feelings of bearing down, weight in the perineum, dragging in the loins, and there may be much disturbance, or even temporary arrest of the functions of the bladder and rectum. Often, there is difficulty in walking. In cases of complete descent, great uneasiness is of course produced by friction of the thighs upon the tumor, and the irritation caused by urine passing over the exposed mucous surface is extreme, often ending in unhealthy ulcerations. There is also generally much derangement of the functions of the stomach.

The complaint is sometimes complicated by hypertrophy or tumors of the uterus, or of the ovaries, by ascites, by polypus of the uterus, by leucorrhœa, by menorrhagia, or by calculus in the bladder.

The objects of treatment are threefold. 1. To replace the organ; 2. To retain it in its proper situation; and 3. To protect and support it when it is irreducible.

The replacement, as already remarked, is frequently effected without aid, on the patient assuming the recumbent posture; or, it may be done with more or less force directed against the tumor, always in the direction of that axis of the pelvis through which it is at the time passing. If any difficulty is apprehended, care must be taken to secure complete evacuation of the bladder and rectum before the attempt is made. Sometimes, from the causes already enumerated, it is for the time at least irreducible. But continued maintenance of the horizontal position, and the use of local antiphlogistics, if necessary, will generally restore reducibility. In some rare cases of long standing, the reduction, although easily enough effected, cannot be tolerated by the patient, and in others reduction remains altogether impossible.

When the case is recent, and produced by violence, simple reduction, with maintenance of the horizontal position for a few days, will be sufficient. In some examples, it is necessary, in addition to this, to use means to restore the tonicity and contraction of the relaxed and extensile vagina. For this purpose, frequent irrigation of the canal, with cold water, or continued use of astringent ointments and lotions, are very serviceable. Attention must be at the same time paid to heal up ulceration, and to remove leucorrhœa. In most cases, however, the use of a pessary is required. It may be either worn constantly, except when removed for the sake of cleanliness for a few minutes, or it may be laid aside during the night. It should always be as small as is consistent with efficiency, the size ranging according to the conditions of

the case. If the perineum is much injured, a bandage may be necessary to retain the pessary. And this must be kept clean, by removing and replacing it, with a frequency varied according to the material of which the pessary is made. A great deal has been written concerning the material of the pessary, and its shape. Different practitioners are in the habit of using different forms, and it not unfrequently happens that after trying several, the patient herself is the best judge of what is most suitable. The ball pessary of boxwood is one of the most useful: the ring pessary is often recommended to married women, but requires particular watching, lest the cervix uteri pass through the ring and become strangulated there. Pessaries more or less cup-shaped, and having a stem attached, are particularly applicable to those cases where the destruction of the perineum renders a bandage necessary.

In some cases the wearing of the instrument eventually effects a cure; but in others, dependent on relaxation, it may prevent that result; and in these it should not be used till other remedies have been tried in vain.

In all cases, the utero-abdominal supporter of Hull, or some of its numerous modifications is very useful, if no special cause exist to prevent the patient wearing it. By supporting partly the weight of the bowels, it lightens the pressure upon the womb; the padded understrap counteracts the prolapse from below; and the machine gives general support and a feeling of security to the patient.

Operative interference has been resorted to in aggravated cases, and not without some success; it is most applicable to those not exposed to the risk of childbearing. The labia have been made raw, and adhesion between them effected, so as to occlude the vagina, excepting a small passage for the vaginal excretions. *Episoraphy* has also been successful; it consists in carefully paring off longitudinal slips of the mucous membrane of the vagina, and uniting the edges of the wounds by the necessary number of interrupted sutures. Cauterization by the hot iron, or the mineral acids, has also been resorted to for the same purpose. When the knife is used, great care must be taken to arrest bleeding timeously.

Finally, if reduction is impossible, a protecting and supporting truss must be adapted to the case, after the manner of a suspensory bandage.

Displacements of the Uterus.

This organ is frequently found lying in an abnormal position. It may be dislocated *en masse*, or its body may be displaced in regard to the cervix; and the most common malpositions are either backwards or forwards, forming, in the one case, an anteversion or a retroversion, and in the other an anteflexion or a retroflexion. The flexions, especially the retroflexion, are sometimes congenital. These changes may be simple or complicated. Frequently they coexist with tumors, chronic metritis, hypertrophy of the womb, leucorrhœa, or ovarian irritation. When uncomplicated, they may cause no painful symptom whatever; but sometimes they produce great difficulty in standing or walking for even a short time, disturbance of the functions of the bladder or of the

rectum, a feeling of weight and bearing down, a sense of pressure at the anus, pain on going to stool, as well as many of those numerous neuralgic and other symptoms which accompany all the chronic uterine affections.

On passing the finger to the roof of the vagina, the cervix uteri is found more or less displaced from its natural position; and a hard, often tender, rounded tumor is felt through the vagina. This is found to move with the cervix, and may sometimes be traced to be continuous with it. In thin and relaxed women, it is possible during examination, by placing the free hand over the hypogastrium, and using the necessary palpation and pressure, to feel the position and relations of the entire organ.

The affection is diagnosed by introducing a bougie or probe into the cavity of the organ, and ascertaining its entrance into the tumor felt through the roof of the vagina. Generally, by means of the probe, it can be depressed or removed from the finger by replacement.

Treatment consists in removing all local congestion and inflammation, combating uterine hypertrophy and engorgement, arresting leucorrhœa; in short, removing, as far as possible, everything which can be regarded as a cause of the production or continuance of displacement. Maintenance of the horizontal posture, for a length of time, is often of great service as an adjuvant. In some cases, the vaginal, and in others the intra-uterine pessaries of Dr. Simpson may be tried with caution.

Stricture of the Cervix Uteri

May be congenital, or may result from inflammatory engorgement and induration. The stricture, if congenital, is generally at the os externum, or at the os internum. If acquired, it may be found at any part of the cervix, or may partially close up some extent of it. It is not of frequent occurrence; but when present is often the cause of dysmenorrhœa, and sometimes it prevents conception. It is discovered by the symptoms of dysmenorrhœa; or, physically, by the difficulty of passing even a small probe through. Every case, however, where a probe cannot be easily passed, is not therefore to be considered a case of stricture. There may be obstacles to passing a probe into the cavity of the uterus from many other causes, as flexion or version of the uterus, the presence of tumors, and difficulty of adjusting the probe to the direction of the long axis of the neck and cavity of the organ.

Treatment consists in dilating the cervical canal. This may be effected by a succession of bougies, or of small pessaries with an intra-uterine stem, as is done in stricture of the urethra or rectum. The instrument, however, may be safely left much longer *in situ* than in the cognate affections. In fact, it may often be left for days with safety.

If the disease is inflammatory in its origin, however, the pessaries would merely irritate, without producing benefit. In such cases, especially if there is any engorgement, it is often better to use the bistouri-caché, or the uterotome of Dr. Simpson, a similar instrument, adapted to this particular case. By means of this, the stricture is divided from within outwards; the blade being made to project only to a small

extent. If the neck is small, the incision must be proportionally diminished, as there is danger from dividing the vascular trunks which lie on the peritoneal aspect of the proper tissue of the cervix.

Uterine Polypus.

Uterine Polypi may be of various structure (*Principles*, 3d Am. Ed. p. 390). Before their removal, we can in some cases determine their pathological nature by their consistence, by their seat of insertion, by their size, by their history, and by the concomitant symptoms.

The size of the polypus may vary from that of a millet-seed to that of a child's head. In fact, their growth is limited only by the capacity of the pelvis. The largest tumors are generally fibrous in their structure. The mucous vary much in size; the smallest being generally vesicular or cellular in structure. Sometimes, the mucous polypus is so small and sessile as to be with difficulty discovered.

The insertion of these tumors may be at any point on the internal surface or os of the uterus. Very rarely, they are found implanted in the vaginal walls; either having originally sprung from that part, or, as still more seldom happens, having formed a second insertion by adhesion. Polypi have sometimes been observed growing by two roots from the uterine walls; the roots having an identity of structure; and sometimes the second root is merely the accidental result of adhesion.

A polypus may be inserted by a pedicle or stalk; or it may be sessile. The pedicle may be of any thickness; it may be several inches long; or its length may be inappreciable.

Sometimes polypi are found projecting from the vagina, suspended from the uterus by a long slender pedicle. These have been designated by French authors *polypes à pendule;* and are generally observed in women considerably advanced in life, in whom the polypus has grown without occasioning much if any annoyance.

The vesicular, mucous, and cellular polypi may spring from any part of the internal surface of the uterus. Not unfrequently several may be met with at the same time in the cervix, or adhering to the os. The fibrous polypus generally grows from some part of the body of the uterus.

The most urgent symptom of the affection is loss of blood. This is the chief source of the mischief the tumors produce; and the consideration of its arrest is generally what leads to their discovery. It rarely happens that a woman dies directly of loss of blood from this cause; but there frequently results an extreme state of anemia, leading ultimately to a fatal termination. Violent, and sometimes fatal *post-partum* hemorrhages are occasionally connected with this as a cause.

Bleeding may take place at the monthly periods, or at irregular intervals. It is frequently brought on by long continuance in the erect posture, by exertion in walking, or by jumping from a height; or it may occur without any assignable cause. It may in its flow resemble the ordinary menstrual discharge; or the blood may issue in a continuous stream from the vagina. The quantity lost has no constant relation to the size of the tumor. The fibrous polypus is generally believed to be

the most frequent cause of serious hemorrhages; but these may occur with polypi of any kind, even the smallest. Farther, in some cases, there may be no bleeding at all; there may even be amenorrhœa.

In the intervals of hemorrhage, there may be no discharge from the vagina. Generally, however, there is a mucous or muco-purulent secretion; and in cases of large polypi, this is often abundant. Sometimes it is mixed with blood; occasionally it is very fetid, especially if the polypus is ulcerated or breaking up. When the growth is intra-utèrine, the blood may sometimes be observed distilling from between of; the lips of the cervix.

The other symptoms accompanying polypus need no particular description. They are those common to all affections of the uterus. Occasionally, one of these symptoms is very prominently complained of; as pain in the hips, verging to sciatica; also pains in the mamma.

Examination with the finger generally discovers the growth. If, however, it be very small, care may be required. Sometimes a smooth, soft, and easily movable polypus, with small pedicle, remains undiscovered, although of considerable size; the finger always pushing the growth before it, instead of passing round it, as in general is easily done. If the tumors are small, and lodged in the cervix, they may be better exposed after dilatation of this, by means of a sponge tent. By the same means, an intra-uterine polypus may be detected. The speculum also may be used to expose a polypus for examination by the eye. But, it may be added, that these growths not unfrequently cause no inconvenience whatever; and are discovered only by accident.

Polypus is distinguished from cauliflower excrescence, by the latter having a broad attachment to the cervix, by its free bleeding when touched, by its profuse watery discharge, by its rough granular surface, by its accompanying cancerous cachexia, and lastly, by the results of treatment. Polypus is also liable to be mistaken for inversion of the womb (p. 612).

The treatment of uterine polypus consists simply in effecting its removal. Bleeding has the same treatment as other forms of uterine hemorrhage unconnected with labor. If violent, and proving dangerous, it may be commanded by the plug. If slighter, it may be arrested by placing the patient in the horizontal posture, keeping her cool, applying cold locally over the vulva and hypogastrium, administering cold enemata, or, in some cases, cold and astringent vaginal injections, cautiously, and using internally the common astringent and refrigerant medicines. As in many other hemorrhages, opium is of service (*Principles*, 3d Am. Ed. p. 351).

Removal may be effected in various ways. The quickest, and in most cases the best plan, is the direct use of the knife or scissors, through the speculum—or without it, using the finger, or fingers, as a guard. When the polypus is large, and can be well seized by a volsella, it may be dragged down to the vulva, and its stalk divided there by knife or scissors. If the growth be very bulky, it may be necessary to enlarge the vaginal opening by incisions. When the stalk or base is large and broad, it is safer to cut near the tumor, rather than near its insertion; on account of the danger of incisions implicating the uterine

walls. If difficulty is felt as to the proper site of the incisions, it is preferable to use some of the slower, but in this instance safer methods of removal. And in all cases it is to be remembered that it is not necessary to take away the whole pedicle; for the part left after separation of the polypus quickly disappears. After removal there is rarely any alarming hemorrhage; but it must be carefully watched for, and early arrested.

A ligature of whipcord, or silver wire, may be thrown around the pedicle, by means of Gooch's well-known double canula (p. 613), or by any of the numerous modifications of it, which best suits the operator's fancy. The ligature is to be daily tightened, till it cuts its way through the stalk; when both polypus and instrument are to be removed.

But the direct use of the knife is perhaps, upon the whole, the safest method; as the other modes are tedious, and on account of continuance of fetid discharges from the half separated and decaying polypus, as well as from the irritation of the ligature, there is risk of untoward inflammation being excited—especially phlebitis.

It may happen that a polypus of moderate or small size may be difficult to deal with, either by ligature or cutting instrument; and under such circumstances, it is sometimes possible to destroy it by compression, or by bruising with strong forceps; as a stone is crushed by a lithontriptor. It may then be either left to slough away; or, if soft and easily lacerable, it may be twisted off and brought out with the instrument. Small, sessile, mucous polypi may often be conveniently destroyed by nitrate of silver; or a stronger caustic may be used, if necessary.

Extirpation of the Cervix Uteri

Is performed chiefly in cases of malignant disease still confined to this part, and when the peculiarities of its site, and its prominence into the vagina, render complete removal feasible. The operation is sufficiently simple; the only point requiring particular care being to keep the incisions in the cervix below the peritoneal reflections—at the same time removing as much as can safely be done.

The patient is laid on her back, in the position for lithotomy; or flat on her face, with the hips raised, and the legs dependent. The cervix is seized by strong hooked forceps, and gently but determinedly dragged downwards, till it appear at the os vaginæ, through which it is at length drawn. If the patient has never borne children, or if the os vaginæ be small and contracted, it may be dilated by one, two, or three small incisions, made either posteriorly or laterally. After the cervix has been drawn down, the insertion of the vagina is made out, in order to judge of the position of the peritoneal reflections, and to avoid including the bladder in the incisions. The necessary amount is then taken away, either by large and powerful scissors, or by the scalpel. Our chief confidence for the arrest of hemorrhage is to be placed in careful and thorough plugging of the vagina by lint (p. 606).

The amount of bleeding may be inconsiderable; or a large quantity may be lost. And it may happen that a case, otherwise adapted for

the operation, may be unable to bear, without the greatest risk, even a small loss of blood. Under such circumstances, a modification of the operation may be resorted to. After dragging down and exposing the cervix, it may be encircled in a strong ligature; or it may be transfixed, as often as may seem fit, by a needle armed with a double ligature; the different parts being separately tied. And the part below the ligature may then be excised with safety.

Malignant Disease of the Uterus

May assume one of three principal forms; the corroding ulcer, malignant ulceration without much interstitial cancerous deposit; the cauliflower excrescence, springing from the cervix; and the common cancer of the uterus, which may be scirrhous or encephaloid, very rarely colloid.

The *Corroding Ulcer* is not a common affection. It is distinguished from simple ulceration by its granulated surface, by the fetor and profuseness of the discharge, by the occurrence of hemorrhages, by the nature of the pain, which is generally severe and lancinating, by the unhealthy malignant local characters, and by the presence of the malignant cachexia of system. From ordinary cancer of the womb it is easily known, by the want of extensive induration, by the mobility of the womb; and often, though not always, want of tenderness to touch is also distinctive. As it advances, it consumes or corrodes the tissues; spreading into the uterine cavity; attacking and destroying the recto-vaginal and vesico-vaginal septa.

The disease is irremediable. But attempts have been made to arrest its progress while the cervix alone was implicated, by excising the part in the usual way. Frequently, the use of caustics seems to retard advance, to improve the nature of the discharges, and to diminish the tendency to repeated hemorrhage. For this purpose, the pencil of lunar caustic, and the actual cautery are of most service. The extreme fetor of discharge is to be corrected by copious use of the chlorides upon the recipients of the discharge, and as a lotion; used very gently internally, if there is little tendency to bleeding. A weak solution of the chloride of soda is suitable for this purpose. In addition, all the general rules for the palliation of cancerous disease are here applicable (*Principles*, 3d Am. Ed. p. 315).

Cauliflower excrescence is also an unfrequent complaint. It consists in the projection of a malignant mass, which may be of various shapes, into the vagina. It springs from the cervix, and generally has a large base. It is covered by a number of small pedunculated bodies or granulations, which are often in bunches, and give the general appearance of a head of cauliflower. It is of a bright red color, and easily made to bleed. The general symptoms are those of ordinary cancer of the uterus; but the watery and bloody discharge is usually excessive in amount. On examination, a tumor is discovered, with the characters above stated; it is felt to be movable and polypoid; and if the disease is in an early stage, the uterus also is not fixed. It is to be distinguished from the polypoid masses of encephaloid, which sometimes grow

from the interior of the cervix, but along with which there is much diffused cancerous infiltration. If the excrescence be the sole discoverable malignant affection, and if there be every reason to think that it might be completely and favorably extirpated, the operation of excising the cervix should be performed. And during healing of the wound, care should be taken, by the use of caustics, to procure healthy cicatrization, and prevent, as long as may be, any tendency to repullulation of the growth. In numerous cases, the operation has been successful in procuring complete relief, and apparent cure—at least for a very considerable time.

During the course of the disease, cold and astringent lotions are sometimes of service in checking the amount of discharge.

Cancer of the Uterus occurs at all ages; but increases in frequency from the period of puberty till the end of monstrual life. It presents itself most frequently in the form of scirrhous infiltration, and more rarely encephaloid.

The scirrhous deposit generally commences in the neck, and spreads from thence; the encephaloid more frequently attacks other parts of the organ first, and sometimes forms projecting and polypoid masses in the vagina, or on the cervix and body of the uterus; it is softer to the touch, and probably gives rise to bleedings at an earlier period. With encephaloid, too, there is more enlargement and hypertrophy of the non-cancerous parts of the organ, than with scirrhus. It sometimes but rarely happens that the vesico-vaginal or recto-vaginal septa are first affected with malignant deposit—the disease spreading from thence to the cervix uteri.

At the outset, there is frequently much ill-defined derangement of the general health, which proves but little amenable to treatment, and often distracts the attention of patient and practitioner from the real seat of disease. And even when the malady has made some progress, but is still in an early stage, the distance of the severest pains from the womb, their lancinating and neuralgic character, and the small quantity, or even unusual absence, of discharge, may deceive. But as soon as ulceration is established, the nature of the discharges and their mixture with blood at once give the alarm.

Patients frequently suffer from pain in the mamma, also in either the right or left hypogastric region, of a wearing kind, with frequent recurrences of stabbing and lancinating shoots; also from fixed pain, often of a burning kind, in the region of the womb; from pain in the back: from pain and restlessness in the legs; from pruritis of the vulva, and irritation of the bladder; also from constipation, and feeling of bearing down or pressure upon the anus. These sufferings may continue during all the course of the disease, or may be at different times substituted the one for the other.

Before active ulceration commences, there may be no discharge; or there may be a secretion of thin, serous, acrid fluid. Sometimes, even when there is superficial and slowly progressive ulceration, there may be little or no discharge; as is sometimes seen in cases of open scirrhus of the mamma. But, in general, as soon as ulceration commences, there appears a large quantity of muco-purulent secretion, which soon be-

comes fetid and mixed with debris from the seat of disease. Hemorrhage also occurs; either merely at times tinging the discharge more or less, or, if a considerable vessel has been ulcerated through, flowing in a continuous stream.

On examination in an early stage of the disease, the cervix uteri is found enlarged, hard, irregularly nodulated, more or less tender to the touch; the os much increased in size, and more or less dilated. On inspection, the cervix is seen to be generally of an unhealthy red color, and there may be excoriations in the sulci between the nodules; the excoriations being of a deep red color, and the nodules projecting and often showing very little redness.

Cancer of the uterus is generally of easy diagnosis; patients generally presenting themselves after ulceration with its accompanying discharges has commenced, and infiltration into the cervix and surrounding tissues is considerably advanced. It is liable to be confounded with hypertrophy of the cervix, with fibrous tumor of the uterus, and with polypus; and the grounds of distinction have already been given in treating of these subjects.

The disease is incurable; and treatment is confined to palliation. Sometimes the excessive watery discharge may be moderated by the use of astringent lotions, or the application of astringent ointments; especially those having tannin in their composition. If there is much tendency to hemorrhage, no local application can be used with safety. Bleeding, when it occurs, must be arrested in the usual way—horizontal position, cold, styptics, astringents and opiates internally, and plugging if necessary. Fetor in the discharges is corrected by use of the chlorides. The pains in the hypogastrium and loins may be relieved for a time by blistering, or by cupping; no blood, or a small quantity, being taken—according as there is little or much sharpness and frequency of pulse, or the reverse. The local application of ice, or of refrigerating mixtures, through the speculum, has sometimes been of service. But for the pains of this, as of all other forms of cancer, the great remedy is *opium*.

When the disease is seen in an early stage, the cervix still mobile, and presenting only some prominent indurations—and if other circumstances, as the general health and age of the patient, are propitious—an attempt may be justifiable to remove the part by excision, or by strong caustics used as already described, in speaking of the inflammatory hypertrophy of the cervix, and of corroding ulcer. If this cannot be done, it is prudent to interfere with the parts as little as possible. If there is much cancerous deposit and induration, any violence, such as even introduction of the speculum, is liable to do much harm, by tearing or bursting the lacerable structures and inducing hemorrhage.

Books on Midwifery, *passim*.—Leake, Astruc, Clarke, Dewees, Gooch, Boivin and Dugès, Blundell, Meigs, Hamilton, Lee, Lever, Ashwell, Churchill, on Diseases of Women, or of the Uterus. Dupuytren, Leçons Orales. Nauche, Maladies propres aux Femmes. Lisfranc, Maladies de l'Uterus. Duparcque, Altérat. Organiques de l'Utérus. Siebold's Frauenzimmerkrankheiten. Meissner, Ueber die Polypen, &c. Bennett on Inflammation of Cervix Uteri. Locock, Art. Leucorrhœa, in Cycl. of Pract. Med. &c. Mackintosh's Practice of Physic. Whitehead on Abortion and Sterility. Waller, Art. Uterus, in Cycl. of Pract. Med. Safford Lee on Tumors of Uterus, &c. Ingleby, Facts and Cases in Obst.

Med. Simpson, Dublin Journal, Nov. 1846, also May, 1848; also various articles in Edinburgh Monthly Journal. Newnham on Inversion of the Uterus. Déneux, Tumeurs sang. de la Vulve. Jobert, Traité de Chir. Plastique. Walshe on Cancer, &c. &c. &c. [On Vesico-uterine Fistula, see Madame Lachapelle, Pratique de l'Art des accouchements, Paris, 1821, 1825. Stoltz, Mémoire sur les Perforations du col de l'Utérus et les Fistules Vésico-Utérines et Vésico-Abdominales à la Suite de l'Accouchement, par M. le Docteur Stoltz, de Strasbourg. Jobert (de Lamballe), Traité des Fistules Vésico-Utérines, Vésico-Utéro-Vaginales, Entéro-Vaginales et Recto-Vaginales, Paris 1852. Cases of Vesico-Vaginal Fistula successfully treated, by Geo. Hayward, M. D., Boston, 1851. On the treatment of Vesico-Vaginal Fistula, by J. M. Sims, M. D., Am. Journal, Jan. 1852.—Ed.]

CHAPTER XXXVIII.

OPERATIONS ON THE BLOODVESSELS OF THE LOWER EXTREMITY.

The Aorta.

Compression *of the Aorta* may often be of service in cases of pelvic hemorrhage; assisting both Nature and the surgeon in their hemostatic means. And it can be readily effected by direct compression of the vessel against the vertebral column—a little above, and to the left side of the umbilicus—when obesity, abdominal tumor, or intestinal distension, do not interfere.

Deligation of the Aorta is very seldom required of the surgeon. Spontaneous obstruction of the vessel, doubtless, has occurred, in a few cases, without serious consequences ensuing. But this event is wholly different from the abrupt mechanical obstruction by ligature; and, besides, the ligature cannot be applied without the infliction of a most hazardous wound.

From the operation, a permanently successful result cannot be expected; it must, we fear, be regarded as inevitably fatal. But circumstances may, notwithstanding, occur, such as warrant its performance with the object of protracting existence for a few hours; saving the patient, perhaps, from death by the direct effect of hemorrhage, and affording an opportunity for the arrangement of temporal affairs; yet inspiring no rational hope of ultimate recovery. The vessel may be reached in one of two ways; directly, by incision through the abdomen; or indirectly, on the outside of the peritoneum, by extension of such a wound as is suitable for deligation of the common iliac. Were there a chance of successful issue, the latter method, though the more difficult, would certainly be preferred. But, as it is, the direct mode is likely to be adopted, by any one who may unfortunately find himself compelled, by a sense of duty, to undertake so unpromising and serious a procedure. The bowels having been opened by a warm purgative, so as to void both their gaseous and their solid contents, a suitable incision is made in the mesial line, commencing above the umbilicus, and terminating a little below it. The intestines are carefully pushed aside, the peritoneum is again cut through, the vessel is exposed, and a ligature applied.

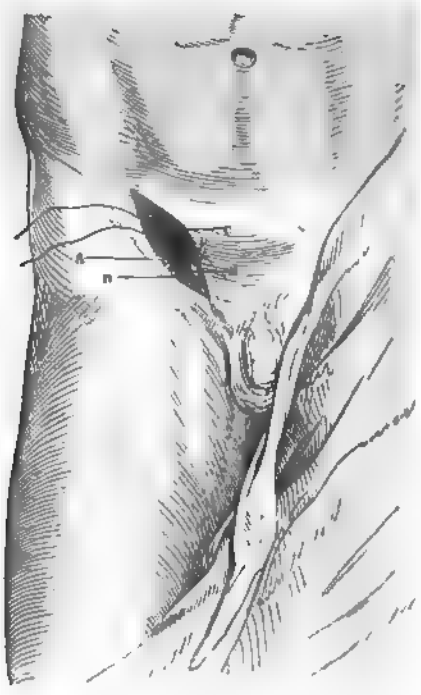
Aneurism of the Abdominal Aorta itself, is obviously remediable only by general treatment (*Principles*, 3d Am. Ed. p. 555). In the nervous, hysterical, dyspeptic, and anemic, the affection is simulated by

great abnormal pulsation in the course of the vessel. It is known by distinct perception of a tumor, which is not movable; by observing that the tumor pulsates equally in all directions; by pulsation and bruit being limited to this one part of the vessel, not diffused equally along its course; by the bruit being equally distinct in the supine and in the erect postures; and by the pulsation being constant, not occasional and intermittent. At the same time, it is right to state that the diagnosis of abdominal aneurism, especially in its incipient state, is often very obscure; solid tumors, in the neighborhood of the artery, partaking of the aneurismal characters very closely.

The Iliacs.

On account of inguinal aneurism, and aneurism affecting the common femoral artery—also on account of hemorrhage not otherwise repressible—the *External Iliac* may require deligation. Due systemic preparation having been made, the patient is placed recumbent, with the abdominal parietes relaxed by position; and the surgeon proceeds to operate, with the intention of securing the vessel without injury of the

Fig. 246.



Ligature of the External Iliac. The wound supposed to be held open. a. Artery. b. Vein. c. Peritoneum. d. Spermatic Cord.—(*Skey*, p. 270.)

peritoneum. Many forms of incision have been proposed and followed. That of M. Lisfranc is exact and suitable; exposing the vessel readily

enough; not calculated unnecessarily to weaken the abdominal parietes; and, at the same time, causing little risk to the spermatic cord and artery, or to the circumflex artery and vein. The knife is entered, two lines above, and an inch within, the anterior superior spinous process of the ilium; and, being carried downwards, the incision is terminated at an inch above the level of the spine of the pubes, and about an inch and one-third on its external aspect. By cautious dissection, the abdominal layers are divided; the fibres of the transversalis muscle—pinched up with forceps—being cut with extreme caution. The transversalis fascia is then scratched through with the point of the knife—near the upper abdominal aperture, where the cord enters the inguinal canal, and where this fascia may be expected to be especially distinct, as well as loosely connected; and, the finger having been introduced through the aperture, on this the rest of the fascia is divided in safety. The peritoneum, separated from the fascia, is pushed aside; and is held out of the way, either by the fingers of an assistant, or by means of a flat copper spatula. The inner border of the psoas muscle is traced with the finger; and, by its pulsation there, the artery will be detected. The vein is found on the inner side, and is cautiously separated by the finger-nail, or by the point of the knife; the artery is then more fully isolated, by the same means; and the aneurism-needle is passed on the inner side—being inserted between the artery and vein. The wound is managed in the ordinary way; and, by position of the trunk and limbs, abdominal relaxation is maintained.

This operation is, in general, easily performed; unless, when great obesity is encountered; and is, perhaps, the most successful of its class. In aneurism, the point for securing the vessel must necessarily vary, according to the bulk and site of the tumor.

The *Internal Iliac* may require deligation; on account of aneurism of, or hemorrhage from, its branches. Bleeding from deep perineal wounds, for example, may not otherwise be restrained. And in false aneurism of the gluteal or ischiatic arteries, this operation is usually considered preferable to direct incision of the tumor. The securing of the vessel, however, is attended with a considerable amount of both difficulty and hazard; and, fortunately, is but seldom required. The patient having been placed as before, an incision is begun over the upper abdominal aperture, and carried upwards, as in the line of the former incision, to the extent of three, four, or five inches; the extent varying according to the contemplated depth of the vessel, and always leaning rather to the side of unnecessary amplitude. The comparative length of the external wound, intrinsically, will have but little effect on the success of the operation; and yet it has a most important bearing thereon, according as it facilitates, or impedes, the accomplishment of exposure and deligation. The abdominal muscular layers having been cautiously cut through, the transversalis fascia having been divided, and the peritoneum having been pushed aside, the sacro-iliac articulation is felt; and there the vessel will be found pulsating, in close connection with its vein, and perhaps with the ureter also—both of which parts are to be avoided carefully. The origin of the vessel is nearly opposite the centre of a line, drawn from the anterior superior spinous process of the ilium to the umbilicus. Frequently, the external iliac—first found—will

prove the best guide to the internal. Isolation is effected by the finger-nail, or by the end of the needle. It is not safe to use the knife's point at such a depth. The vein, situated posteriorly, is especially cared for. The wound being then fully opened by assistants, the needle is passed,

Fig. 247.

Wound of the Abdominal Parietes; supposed to be held aside showing the Iliacs. *a*. A ligature round the Internal Iliac. *b*. A ligature on the Common Iliac. *c*. Ligature of the External Iliac.

from within outwards; taking care to avoid the ureter and peritoneum internally, and the external iliac vessels externally; and selecting the point of deligation at a suitable distance from the iliac bifurcation.

The *Common Iliac* may require deligation, on account of either aneurism or hemorrhage implicating the external and internal iliac arteries; or on account of secondary hemorrhage after high amputation in the thigh. It is reached by an incision similar to that just described; and is, perhaps, as easy and promising an operation as the preceding. The vein is found on the inner and posterior aspect of the artery, on the left side; behind and external to the artery, on the right.

A similar incision, extended upwards, may serve, as already stated. for deligation of the aorta (p. 625).

The Femorals.

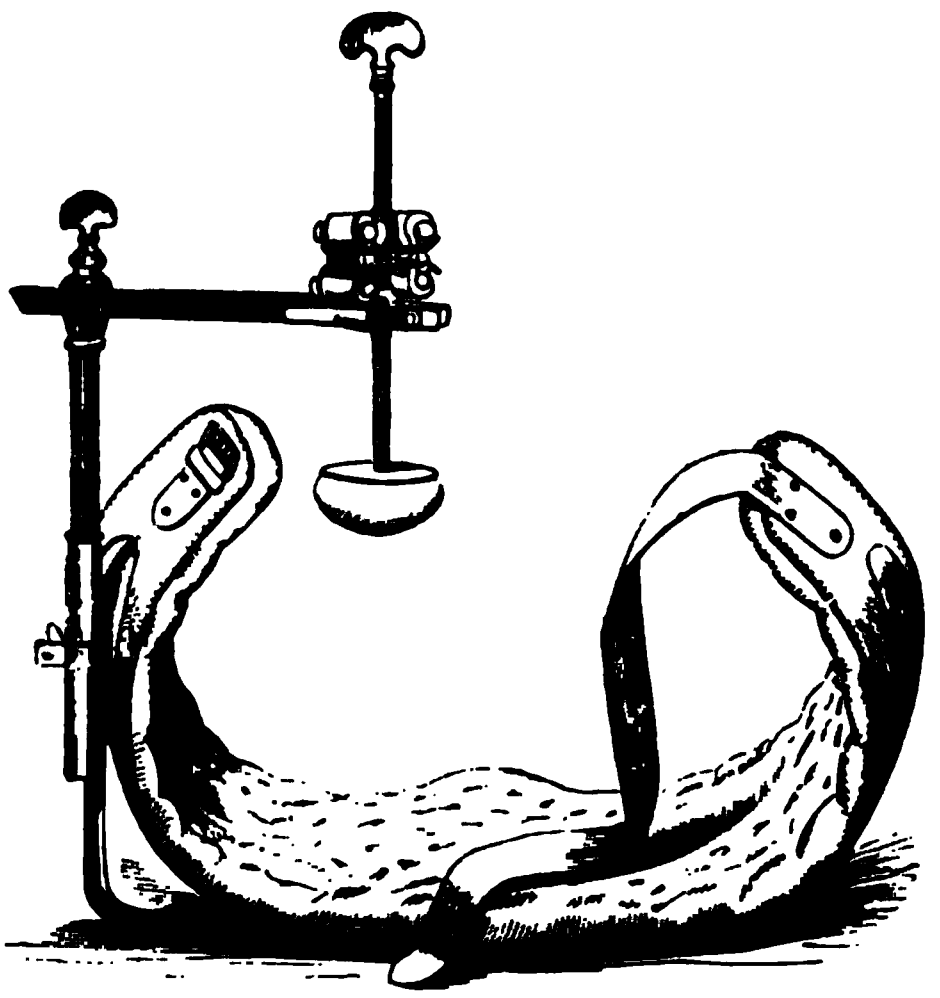
Aneurism of the common femoral, as formerly observed, requires deligation of the external iliac. False aneurism may form in the superficial femoral; and, for this, the ordinary operation for such an accident is requisite; namely, incision of the sac, and deligation of the artery above and below the wounded part. Aneurismal varix, too, is occa-

sionally met with here, of traumatic origin; a penetrating wound having been inflicted by the grasping of a knife, or other sharp-pointed instrument, between the thighs. It may prove but little troublesome, and demand no other treatment than support of the part by bandaging.

The Popliteal is probably the most common of all external aneurisms; and, hitherto, the Hunterian application of ligature to the superficial femoral, has been the only approved mode of treatment. Latterly, however, as elsewhere explained (*Principles*, 3d Am. Ed. p. 545), the application of pressure, instead of the ligature, has been employed. And experience is, almost daily, giving direct and undoubted testimony to the efficacy of the practice. There are some patients, doubtless, who may prove intolerant of pressure; and there may be others who prefer the apparent certainty of the knife and ligature, to the apparent uncertainty and delay of the compressor. But the greater number of cases are assuredly capable of cure by pressure properly applied; without risk, with but little pain or inconvenience, and without any wearisome amount of privation or confinement. The skin, which is to bear the pressure of the instrument, is protected by a layer of thick soap-plaster; and that, again, may be covered by leather. More than one compressor is used; or, at least, pressure is made at different parts, at different times; so that the burden of it may not all be thrown on one point, but, by being subdivided, may be rendered more tolerable.[1] Using several

[1] The mechanical means for compression are undergoing change, and are, doubtless, destined to become more simple and more perfect. Dr. Carte's instruments for making accurate and elastic pressure on the vessel at the groin, and in the upper part of the thigh, are efficient and ingenious, but complicated and expensive. Some have used

[Fig. 248.]



[Carte's Instrument for compressing the artery in Femoral or Popliteal Aneurism. (From Fergusson.)—Ed.]

common leaden weights placed over the vessel, and have found them suitable and satisfactory. For a detailed description of the different instruments, see Tufnell on the *Treatment of Aneurism by Compression*, Dublin, 1851.

instruments, along the course of the vessel in the thigh, they may be slackened and tightened alternately; or the same instrument may be shifted in its site, with a like effect. It is never to be forgotten that all severity of pressure is unnecessary, and that it is not essential to arrest the arterial flow at the compressed point. And it is also important to remember that, should this mode of treatment fail, it by no means interferes with subsequent performance of the ordinary operation; but, on the contrary, the constitutional treatment suitable for pressure, renders the success of subsequent deligation all the more probable. Those surgeons who obstinately adhere to the old operation may adduce, as their apology, a series of successful cases so treated. But this is very plainly a contracted view of the subject; and as well might such practitioners prefer successful amputation of the hand to amputation of a finger, for a simple affection of the latter only. A surgeon of the olden time, who had succeeded in curing several successive cases of popliteal aneurism by amputation of the thigh, might very naturally entertain a distrust and dislike of the proposal to treat the same disease by ligature of the femoral; but the naturalness of such an aversion to the minor and modern practice, would not render it one whit the more reasonable or praiseworthy. And an impartial observer will not consider any one justified in subjecting his patient to serious risk of life, by hemorrhage, suppuration, and gangrene, while he has it in his power to effect cure by a minor means, comparatively devoid of risk, and the failure of which will not militate against subsequent recourse to the major procedure, if necessary. Why should a mode of treatment, which causes little or no risk, always be passed by; or why should an operation always be had recourse to, which may, and not unfrequently does, result in direct loss of life? And the question comes in much force, if it be admitted—and statistics will scarcely warrant even feeble contradiction of this any longer—that the two methods are at least equally successful for the cure of aneurism.

Recorded facts seem to prove the following conclusions: 1. That, in popliteal aneurism, skilful compression of the femoral is capable of curing the disease, and that with comparative, and almost absolute safety to life and limb. 2. That the time expended in cure is, on an average, not greater than in the treatment by ligature. 3. That failure by compression does not compromise subsequent recourse to deligation. 4. And that consequently, compression, when skilfully employed, being equally certain, far more safe, and not more tedious than the ligature, should, in the great majority of cases, be preferred. The only disadvantage of compression is the care and trouble necessary on the part of the attendant, with irksomeness and sometimes suffering on the part of the patient. The obvious and only advantage of deligation, on the other hand, is the facility and dispatch of its execution, with probable exemption from suffering afterwards by the patient, in the successful cases. The formidable disadvantage is, its proved risk to life and limb.[1]

But should a case occur, suitable for deligation, on account of in-

[1] *Vide* Tufnell, *op. cit.*, and Brit. and For. Med.-Chir. Rev. Oct. 1851, p. 470.

tolerance or failure of pressure, or on account of expressed wish and preference by the patient, the operation is performed as follows: The patient is placed recumbent, with the upper part of the thigh suitably exposed. He is directed slightly to adduct and raise the thigh, so as to make the inner edge of the sartorius salient, and, along this, the superficial femoral is traced. An incision of two or three inches in length is then made, in the course of the vessel; so placed, that its centre may correspond to the part of the artery where it is intended to place the ligature. By cautious dissection, the common sheath is exposed, and, very carefully, this is opened, and the arterial coats isolated, to the requisite extent. In the external wound, the saphena vein is avoided; in the deep dissection, avoidance of the femoral vein cannot too prominently occupy our regard. The needle is passed very cautiously, so as to avoid all injury to the vein, which is situated posteriorly, and may be partly seen bulging out on the inner aspect of the artery. The point usually chosen for deligation is where the vessel is crossed or concealed by the sartorius, sufficiently removed from the profunda, as a cross branch, and not too distant from the aneurismal tumor.

In performing this operation, the surgeon should always make sure that the tightening of his ligature has a satisfactory effect on the tumor, for there is the same risk of a high division here, as in the case of the humeral artery (p. 292), and, consequently, two parallel vessels may require ligature.

After deligation, a relaxed position of the limb is maintained, for obvious reasons.

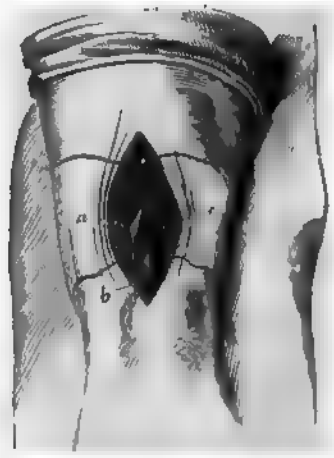
For aneurism affecting the lower part of the femoral artery, a similar operation may be required. For aneurism of the superficial femoral, in its upper part, the *Common Femoral* may be tied. But this vessel is obviously not favorably circumstanced for successful deligation, and, in consequence, the equally simple and greatly more certain operation, on the external iliac, is to be preferred. In recent wound of the common femoral, however, with or without the formation of false aneurism, the ordinary rules of surgery are to be upheld; the part is cut directly into, and each orifice of the wounded vessel is secured. The femoral vein, here on the pubic side of the artery, is carefully avoided.

The Popliteal.

For aneurism, or for bleeding, in connection with the posterior tibial, the Popliteal artery may be tied; but ligature of the superficial femoral, below where it is crossed by the sartorius, is a preferable operation. For wound of the popliteal itself, however, ligature of that vessel is necessary, according to the general principles of surgery. The patient having been secured in a prone posture, a free incision is made, traversing the popliteal space, and penetrating through the skin, areolar tissue, and fascia. The deep dissection is continued cautiously, along the borders of the semitendinosus and semimembranosus muscles. On the edge of the latter muscle, the artery may be felt beating; per-

haps overlapped by it. The vein is superficial, and somewhat external to the artery. The nerve is both on a more superficial plane, and ex

Fig. 249.



Ligature of the popliteal at its upper and lower parts. a. The popliteal vein. b. The popliteal artery. c. The posterior saphena vein. The sciatic nerve, on the outside of the artery, has been accidentally omitted in the diagram.

the exterior of the mesial line. The vessel is most readily exposed and secured in the upper part of its course.

The Tibials.

These vessels may require ligature, on account of recent wound, or on account of false aneurism formed at some part of their course. For secondary hemorrhage, ligature of the femoral is to be preferred; when recourse to an operation of this kind is deemed expedient.

Ligature of the *Posterior Tibial*, at the upper part of the leg, is an operation of considerable difficulty. Two methods are recommended. One consisting of a direct incision on the vessel, through the centre of the gastrocnemius and solæus; the other reaching the vessel from the lateral aspect. The latter is usually preferred. The limb having been placed on its outer side, a free incision is made between the edge of the tibia and the border of the gastrocnemius; the tibial origin of the solæus is then divided; and, the deep fascia having been cut through, the artery will be found about an inch from the tibia, between the concomitant veins, and with the nerve on its fibular side. Separation of the veins is made very carefully, while the edges of this deep wound are as much retracted as possible by means of copper spatulæ; the knee being bent, and the foot extended, so as to relax the muscles of the calf. The needle is passed from without inwards.

At the lower part of the leg, the vessel is reached much more readily; by making an incision on the inner side of, and parallel to, the tendo Achillis, through the two layers of fascia; opening the sheath,

separating the artery from its concomitant veins, and applying the ligature in the ordinary way.

Fig. 250.

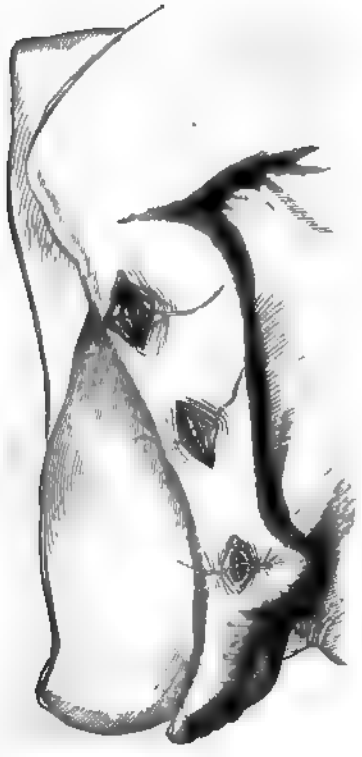


Fig. 251.

Fig. 250. Ligature of the posterior tibial, at various parts. The wounds are supposed to be held asunder. The ligature is under the vessel.

Fig. 251. Ligature of the anterior tibial, at various parts. The wounds are supposed to be held asunder. The ligature is under the vessel.

At the ankle, the operation is also simple. A semilunar incision is made on the inner side of the malleolus, about a finger's-breadth distant from it; indeed, the finger, applied behind the malleolus, may be a sufficient guide to the knife. The fascia of the leg having been divided, a strong aponeurosis is exposed; this having been cautiously cut through, the common sheath is found; and, the vessel having been separated from its concomitant veins, the needle is passed from the heel towards the ankle, to avoid the nerve which is situated between the artery and the tendo Achillis.

The Anterior Tibial may be tied, either at the upper or at the lower part of the leg. The superior operation is difficult. A free incision

is made between the extensor communis digitorum and tibialis anticus; and it is well to make a slight transverse division of the investing fascia, at each extremity of the wound. The foot is flexed. The relaxed muscles are separated down to the interosseous ligament; and, on this, the artery will be found. In the middle of the leg, the artery is placed between the tibialis anticus and the extensor proprius pollicis.

At the lowest part of the leg, a less incision is necessary; the vessel being much more superficial. The wound is made on the fibular side of the extensor proprius pollicis. The venæ comites, and the anterior tibial nerve, are carefully excluded from the ligature.

Should it seem necessary to secure the vessel on the instep, by regular dissection, it is found by an incision on the fibular side of the tendon of the extensor proprius pollicis.

The *Peroneal artery* may be exposed, by a free incision on the posterior and tibial aspect of the fibula. It is found concealed under the inner edge of the flexor longus pollicis.

Deligation of the arteries of the leg, however, being seldom if ever required except on account of recent wound, all rules for regular dissection may be in a great measure dispensed with; the extent and form of incision depending very much on those of the wound already existing, and the bleeding point being the best guide to the injured vessel.

Manec on Ligature of Arteries, Paris, 1832. Harrison, Surgical Anatomy of the Arteries, Dublin, 1833. Knox, the Arteries, from Tiedemann, 1835. R. Quain, Anatomy of the Arteries, with large plates, London, 1840. Dermott, Illustrations of the Arteries connected with Aneurism, 1841. Tufnell on the Treatment of Aneurism by Compression, Dublin, 1851.

CHAPTER XXXIX.

AFFECTIONS OF THE JOINTS OF THE LOWER EXTREMITY.

Morbus Coxarius.

The hip-joint is liable to the common diseases of articulations; but, from its position, the exciting causes of synovitis affect it but little, comparatively. It is a common seat of porcellanous deposit, interstitial absorption, adventitious deposit, and other chronic structural changes (*Principles*, 3d Am. Ed. p. 492, *et seq.*). It is sometimes affected by neuralgia, also; and then is constituted the true *Coxalgia*—a term, which, like its analogue Omalgia, has been improperly applied to structural change. But the most important as well as the most common affection to which this joint is liable, is chronic disorganization of the head of the bone; to which the term Morbus Coxarius is applied.

There is reason to believe that the morbid changes usually observe the following sequence. Interstitial absorption takes place in the cancellated tissue of the neck of the bone; perhaps with deposit of tubercular matter in the opening texture. After a time, a chronic inflammatory process is kindled; and softening and disintegration ensue, affecting chiefly that part which is immediately beneath the articulating cartilage. The cartilage is then involved; partly by ulcerative erosion, partly by necrosis of patches. Matter is effused into the synovial capsule; and acute disintegration is established. The cartilage perishes more and more; the head of the bone crumbles down; the acetabulum is secondarily involved in similar decay; the joint fills, and is reduced to the condition of abscess; the matter makes its way, more or less rapidly, and at one or more points, through the restraining textures; corresponding pointing takes place, followed by evacuation; and then, either the work of disintegration may advance with a fresh and fatal energy, or a lull may be experienced, and anchylosis may ensue. Such we believe to be the ordinary course. But the diseased action may occasionally commence, or at least be contemporaneous in the acetabulum.

A more rapid and acute destruction of the joint may follow inflammatory action primarily affecting the synovial apparatus. But the term morbus coxarius is, in strict accuracy, limited to the chronic and gradually nascent affection, which commences in the hard textures.

The disease is conveniently divided into two stages. The first, the period which is occupied in the incipient change of structure; without such loss of substance as to cause change of form, and with the synovial capsule yet entire; denoted by apparent elongation of the limb. The

second, corresponding to loss of substance, change of form, and destruction of the joint; indicated by the limb's shortening and distortion.

Fig. 252.

Fig. 252. Articular Caries, affecting the hip-joint.

Fig. 253.

Fig. 253. Wasting of muscles shown, with elongation of limb, in disease of the hip-joint. The muscular deficiency is but imperfectly represented; the change of the natal fold, resulting from it, is, however, sufficiently apparent.

The affection is most common in the young, more especially in those of strumous habit; and it may, or may not, be connected with some external injury as its exciting cause.

The primary symptoms are deceptive. They are such as may attend on dentition in childhood, or on general disorder of health in adolescence; they may simulate rheumatism also; and they are every day mistaken for primary affection of the knee. Obscure pains are felt in the knee and thigh, and occasionally in the hip. The limb is weak, and its weakness is complained of—increasing with exercise; it is felt to be long as well as weak; it is dragged, rather than moved, in walking; in standing, it is somewhat advanced, while but little weight is borne on it; and all these symptoms are most observable during fatigue consequent on exercise. An inspection, with the body naked from the waist, is essential. The knee, in which for some time great and almost constant pain has been complained of, may be quite of a normal appearance, and also tolerant of manipulation. The affected limb is decidedly

thinner, softer, and more shrunk in appearance than the sound one, and somewhat advanced in position; resting on the toes and ball of the foot, with the heel raised from the ground. To bring the two heels together requires an effort, with a suitable inclination of the pelvis; and the effort usually causes aggravation of uneasiness. As in the analogous affection of the humerus, the shoulder is flattened by wasting of the deltoid (p. 304); so here is found a flattening of the hip, by wasting of the glutei. The fold between the nates and thigh—deep and almost transverse in the normal state—is sloping, superficial, and sometimes almost effaced. Place the patient recumbent; straighten the spine, and equalize the position of the pelvis as much as possible—and elongation of the limb will be observed; the knees and heels by no means corresponding to each other. Part of this elongation, no doubt, is apparent only—from twisting of the spine and pelvis, which it is impossible altogether to undo; but part of it is real—dependent on relaxation of the ligamentous apparatus, and on increasing accumulation of fluid within the capsule, while as yet no change of form has occurred in the bone; and also in part dependent on the comparative, or even actual disuse of that limb, in bearing the weight of the body during the erect posture.

The foregoing symptoms, however, may almost all be found in the delicate adolescent, without disease of the hip. And a farther examination is necessary for diagnosis; by jarring the joint suspected. Forcible abduction of the thigh causes pain in the hip; so does rotation of the limb; and a still more distinct sensation follows concussion, applied either directly or indirectly—by striking the knee, or the sole of the foot, or the trochanter-major, smartly. There is also tenderness of the groin, and behind the trochanter.

Thus far—the first stage—the disease is capable of complete cure; the limb being left of its normal length, and restored to its normal form and capabilities. But, too frequently, the morbid process advances. Pain and tenderness increase; swelling of the hip becomes more and more apparent; and the thigh is increasingly flexed on the pelvis. A bulging is observable behind the trochanter; and this bone seems displaced somewhat backwards. Enlargement also may form over the groin; and the swellings may be felt to fluctuate. Opening and evacuation ultimately take place; with one of the two results already stated.

In this, the second stage, shortening of the limb is observed; the toes resting on the ground, without any advancement of the limb. As the shortening advances, the toes may not reach the ground at all; but, turning inwards, may dangle over the opposite member, as in dislocation. Or the toes may be everted, as in fracture of the neck of the thigh bone. And it is supposed that comparative destruction of the acetabulum tends to inversion, while comparative destruction of the head of the bone favors eversion of the foot. This shortening is plainly symptomatic of organic change in the joint; destruction of hard tissues as well as soft, deepening of the acetabulum, and abridgment of the head of the femur. And towards such shortening, no doubt, a spastic action of the muscles of the hip contributes somewhat. The hip appears more and more broad and prominent; though really flat and wasted; apparent enlargement depending on atrophy of the rest of the limb, with twisting of the

pelvis. As disorganization advances within, the joint becomes more and more loose; and dislocation may occur, by muscular action alone—

Fig. 254.

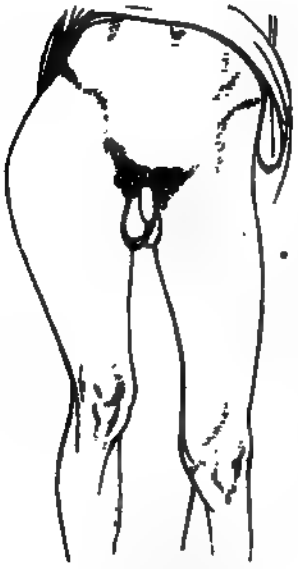


Fig. 254. Shortening, swelling, deformity, lameness; the advanced stage of Morbus Coxarius.

Fig. 255.

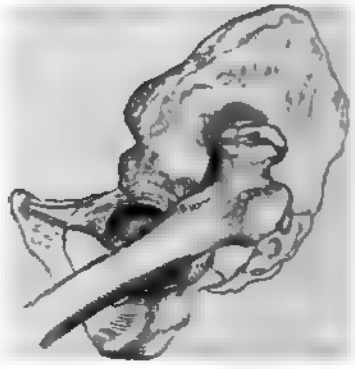


Fig. 255. Luxation of Hip, in consequence of Morbus Coxarius.

without the intervention of a fall or other injury. The dislocation is usually upwards, on the dorsum of the ilium; and this event is of course

Fig. 256.

Cure (?) of Morbus Coxarius by Anchylosis.

followed by increase of shortening in the limb, and by a still greater and more marked deformity of the hip. Matter, in general, continues

to form; and is evacuated at various points; at the groin behind the trochanter, in the thigh. Not unfrequently, perforation of the acetabulum takes place; and then the matter may accumulate within the pelvis, fatally; or it may again take its way outwards, through the sciatic notch, and discharge itself at some part of the hip or thigh; or evacuation may take place by the rectum. Structural change may advance from bad to worse; the patient perishing of hectic. Or anchylosis may take place; the patient recovering with a stiff joint, and a shrunk and deformed limb. In the case of dislocation—by no means of frequent occurrence—it sometimes happens that morbid action ceases, and the head of the bone acquires a new recipient cavity on the dorsum of the ilium. More frequently, however, the head of the bone seems to act as a foreign body in its new site, and causes much inflammatory excitement.

Acute affection of the synovial apparatus in the hip—by some termed the Acute form of Morbus Coxarius—shows the ordinary characters of synovial disease. There is rapid and uniform swelling of the hip, with acute pain in the hip, thigh, and knee, much increased by movement and pressure of the hip; the thigh is bent upward, by spastic action of the muscles; and, very often, an apparent shortening of the limb is to be observed, dependent on twisting of the pelvis; acute fever attends; walking and even the erect posture are impracticable; often the slightest movement, even during recumbency, is attended with great agony. If the action be not speedily arrested, suppuration takes place; the matter is discharged, by one or more openings; and extreme articular disorganization too frequently results, with corresponding disorder of the system. Such a case is met by the ordinary treatment adapted to acute synovitis (*Principles*, 3d Am. Ed. p. 465, *et seq.*). Not unfrequently, the affection is of rheumatic origin.

The chronic disease, or true morbus coxarius, is also amenable to the general rules of practice. But, as already stated, it is only in the first stage that complete cure and restoration to health can be hoped for. The disease cannot be opposed too soon; consequently, tact and experience are of much value, in enabling the practitioner to detect with certainty the obscure and insidious commencement. The paramount indication is rest; one, however, which it is often very difficult to maintain effectively. The patient must be wholly confined to the recumbent and sitting postures; the weight of the body must not, for an instant, be felt by the affected limb. And the best way of accomplishing this, is to put the patient to bed, and keep him there; the parents and attendants having been previously enlisted in the cause, by having the importance of the privation fully explained to them. Should the patient prove refractory, a light splint may be applied, as for fracture of the neck of the bone. And by some, indeed, the wearing of this splint is recommended throughout the whole period of cure, in order to oppose the decided tendency to flexion of the thigh which invariably exists—increasing along with the disease. [The best splint for these cases, is one made partly to inclose the limb, commencing, indeed, several inches above the crest of the ilium, and extending nearly to the outer ankle. It may be made of *Gutta-percha*, moulded to correspond

accurately with the shape of the limb, by being first warmed; of *papier maché;* of stout *binders'-board;* of *sole-leather*, or of *wire ;* in any case fitted to the limb; or it may be carved out of wood.—Ed.] But, probably, relief is obtained by this spontaneous assumption of posture, as in analogous affections of the knee-joint; and, to thwart Nature in this, were to denude ourselves of an important item of the means of cure. Encourage flexion, rather, until the disease has begun to subside; and then undo it gradually, ere rigidity has occurred.

A few leeches are applied over the hip—perhaps with repetition, should heat or pain seem to require this; and then moderate counter-irritation is maintained, by inunction of croton-oil, or tartar-emetic. If the tubercular cachexy be suspected, the suitable opposing constitutional management is put in force—especially cod-liver oil. And by steady perseverance in such treatment, for some weeks, all symptoms of disease may subside; the patient may rise, without any feeling of local ailment; and, cautiously renewing the use of the limb, he may find, in due time, all its functions fully restored. But if the disease threaten to advance, recourse to a higher degree of counter-irritation is expedient; the actual cautery may be applied behind the trochanter; or a seton may be placed either there or in the groin. Rest and moderate counter-irritation were enough, for the period of absorption; but when structural change, by chronic inflammatory results, has fairly begun, the highest grade of counter-irritation is demanded.

In the advanced period of the second stage, all severity of treatment is inexpedient, there being then no longer any hope of saving structure. When matter has formed, and is plainly discernible, seeking the surface, an early opening is advisable—here as elsewhere; an opening must form sooner or later, and early evacuation may not only give relief but may also limit disorganization. Then we may hope only for a minor result of treatment—enchylosis; or for gradual cessation of morbid action, leaving the joint crank weak, yet movable, and a limb impaired in both its symmetry and function. To conduce towards such ends, we mainly trust to general treatment; keeping the parts steady by means of splints.

Now there can be no harm in undoing flexion completely, and keeping the limb straight. Tension of the joint is not likely to occur; so much disorganization having taken place. And by maintaining the straight posture—by means of the long wooden splint, if necessary—dislocation is rendered less likely, and the position is made more favorable for usefulness after anchylosis. In open disorganization of the joint, the straight splint may not be tolerated; then relief is obtained from the gum or leather splints, as elsewhere noticed (*Principles*, 3d Am. Ed. p. 486).

When from synovitis, imperfectly resolved, stiffness of the hip remains, orthopædic treatment may be applied with advantage; friction, passive motion, and perhaps subcutaneous section of resisting muscles. But in the case of anchylosis following structural change in the joint, the result of morbus coxarius, all such attempts will be wisely desisted from; we ought rather to content ourselves with possession of a partial cure, than incur the risk of return of the disease in an aggravated form.

There are cases, however, in which the propriety of resection may be not unreasonably entertained; when, in an open state of the joint, after spontaneous dislocation, the head of the bone seems to cause much excitement in its new site; when there is good reason to suppose that the disease has all along been chiefly limited to the head of the bone, leaving the acetabulum comparatively uninjured; and when it seems probable that, after removal of the head of the femur, quiet might be restored to the joint, and a certain degree of useful motion might be regained. Successful cases are already on the records of surgery.[1]

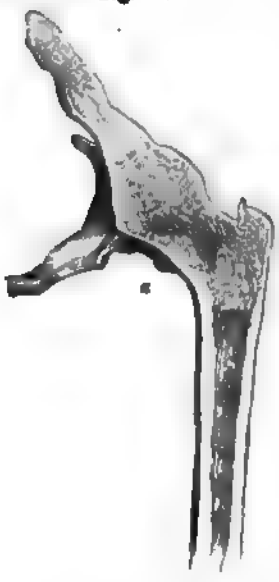
The diagnosis of morbus coxarius from other diseases is important. It is simulated by sciatica, by enlargement of bursæ, by lumbar disease, by rheumatism, by interstitial absorption of the neck of the thigh-bone in the aged, and by wasting of the limb consequent on general irritation in the young. 1. Sciatica is known by the pain following the course of the sciatic nerves; the whole thigh is lame; position of the trochanter, and the length of the limb, are unchanged. 2. Beneath the conjoint tendon of the psoas magnus and iliacus internus muscles, a bursa is interposed where the tendon plays on the capsule of the hip-joint. And this bursa is liable to chronic enlargement; causing pain in the hip and knee, flexion of the thigh, disuse and wasting of the member. The enlargement may be felt, and is painful on pressure; succussion of the joint itself causes no pain; abduction and rotation of the limb are not attended with inconvenience; but forcible extension of the thigh and inversion of the foot cause pain, by stretching the affected part; and pain is also felt when the patient himself flexes the thigh, or everts the foot—the tendon then acting directly on the bursal swelling. 3. Disease of the lumbar vertebræ, inducing neuralgic pains in the hip and limb, and impeding progression, is suspected when there is absence of the positive signs of hip-joint disease, as well as those of bursal affection; and its existence may be ascertained by minute inquiry into the history of the case, with careful manipulation of the lumbar and sacral regions. 4. Young girls, about the time of puberty, or earlier, are apt to fall into a state of general disorder of system. Among other signs of this, lameness of one limb may occur, perhaps with occasional pain of the knee; and, on examination, the limb may be found smaller than its fellow, the muscles soft and flabby, and the hip, consequently, somewhat flattened. Abduction, rotation, and succussion, however, are all well borne; and on the affected limb the patient may hop round the room, with impunity. It were cruel, as well as futile, to confine that patient to constant recumbency, to leech the hip, or to bring out crops of pustules over it. It is sufficient to enjoin moderate exercise, sea-bathing, friction, and general tonic treatment. 5. The other affections mentioned, as liable to simulate hip-joint disease, are detected by ordinary care in diagnosis; they require no special remarks.

[1] *Vide* Lancet, No. 1285, p. 414. In the same Journal, the question of resection, as applicable to this joint, will be found well stated, No. 1283, p. 362.

Resection of the Hip-Joint.

Till lately, this operation has not had a place in surgery. And it is still begirt with difficulty and danger. As just stated, in a few cases of advanced morbus coxarius it may be deemed warrantable; when the head of the femur is dislocated, and is causing continuance or aggravation of excitement; when the joint is open; when the muscles are wasted, and the head of the bone, consequently, is covered with little else than skin and areolar tissue; and when there is reason to believe that the acetabulum is comparatively free from disease. In connection with this last point, it is well to remember that, after dislocation, the acetabulum may take on a healing action, and, instead of remaining ulcerated, become occupied by a fibrous tissue. Also, in gunshot wounds and other similar injuries, involving the head and neck of the femur only, removal of these parts is preferable to amputation of the whole limb; and may be had recourse to unhesitatingly, with a good prospect of success. No decided rules can be laid down to guide the manipulations. The form and extent of the wound will depend, very much, on the nature of the openings which already exist. A sufficiency of the diseased or injured bone having been removed, and the wound having been adjusted, the limb is placed straight, and retained in that position by means of the long splint suitable for fracture.

Fig. 267.



Cure of Morbus Coxarius by anchylosis, bisected; at *a*, section might be made, with a view to the formation of a false joint.

In the case of an anchylosed hip, the neck of the bone may be divided; with the view of forming a false articulation at the sawn part, and so restoring motion (*Principles*, 8d Am. Ed. p. 504). Success has already attended the experiment; its reputation for safety and expediency, however, is as yet by no means determined.

Change of Form in the Hip-Joint.

The chronic changes of form which frequently occur in the hip-joint, have been formerly treated of (*Principles*, 8d Am. Ed. p. 498). By osseous deposit, and porcellanous change—but especially by interstitial absorption of the head and neck of the femur—most serious lameness occurs; slowly, but steadily advancing, often under the cover of symptoms characteristic of chronic rheumatism in the part. Rest, gentle counter-irritation, and constitutional alteratives—especially the iodide of potassium—constitute the treatment; but too often are of little avail.

Fig. 258.

Fig. 258.—Head of Femur and Acetabulum much altered by chronic deposit; causing shortening of the limb, and stiffness of the joint.

Fig. 259.

Fig. 259.—Femur bisected; Head atrophied and altered; Neck gone; the result of interstitial absorption. Shortening and lameness inevitably great.

Affections of the Knee and Ham.

Affections of the knee are not so peculiar as to require separate consideration. This joint, it will be remembered, is especially subject to synovitis, chronic and acute; to disease of the bone, and of the cartilages; and to the formation of loose bodies within the synovial cavity. It is not suitable for the operation of Resection.

Housemaid's Knee—that is, enlargement of the bursa over the patella—is extremely common in housemaids, shopkeepers, and others who habitually exert much pressure on this part. The affection is usually chronic; sometimes, however, the case is acute, and apt then to be associated with erysipelas. The ordinary treatment is required (*Principles*, 8d Am. Ed. p. 511).

Abscess of the Ham is by no means unfrequent; and may be connected with exfoliation from the posterior part of the femur. When the portion of dead bone is large, considerable difficulty may be experienced in effecting its removal; and free incision may be necessary. In such circumstances, caution is obviously required, lest injury be done to the artery, vein, or nerve.

Fig. 260.

Enlarged Bursa over the Patella: the result of pressure. Housemaid's Knee.

Tumors may form in the ham. As already stated, it is perhaps the most frequent site of external aneurism.

Ganglionic and bursal enlargements form, producing more or less inconvenience; and these may be treated by repeated puncture by means of a trocar and canula, or by puncture followed by injection, as in hydrocele.

Erectile, fatty, encysted, and fibrous tumors are also met with. The ordinary treatment is required. Removal should be early, before deep and inconvenient attachments have been formed.

In addition to the ordinary authorities on Diseases of the Joints, see Coulson, on Diseases of the Hip-Joint, London, 1841. Hugman, on Morbus Coxarius, &c. London, 1850.

CHAPTER XL.

INJURIES OF THE LOWER EXTREMITIES.

Fractures.

Fractures of the Pelvis.

The bones of the pelvis give way only under great and crushing force; a heavy weight, for example, passing over or falling on the part. There is but little displacement; muscles not tending thereto. The great risk is from injury done to the important parts within. The bladder may be torn, or it may be punctured by a spiculum, as formerly noticed (p. 504); a portion of bowel may be ruptured; or great extravasation of blood may occur. From such lesions of structure, immediate danger to life results. A risk somewhat more remote follows mere bruise of the interior; inflammatory action being lighted up within, and advancing both rapidly and untowardly. Or, instead of union, abscess may form at the site of fracture.

In treatment, little is to be done in the way of replacement; the chief care must be directed towards avoidance of motion, and the averting of inordinate action. The application of a broad, firm bandage suffices for the former indication; the latter is fulfilled in the ordinary way.

1. A wagon wheel, rolling over the pelvis, may detach *the Crest of the Ilium* from the body of the bone. The upper fragment is displaced inwards; and replacement may be effected by the fingers, ere swelling has occurred. 2. From a heavy and high fall, fracture of the *Sacrum* may result. The fracture is usually longitudinal; and there is no displacement. 3. A kick or fall may cause fracture of the *Coccyx;* and there may be considerable displacement inwards. By means of the finger in the rectum, accurate readjustment may be effected; and it is very obvious that, in the after-treatment, both purgation and constipation are to be avoided. 4. The *Os Pubis* may give way in its horizontal body, or in its descending ramus. This fracture is especially hazardous, from the risk which displacement of the sharp fragments, inwards, entails upon the bladder. The necessary treatment was formerly considered (p. 505). 5. The ascending ramus of the *Ischium* is as frequently broken as any other part of the pelvis. Crepitus is readily felt by the finger in the rectum or vagina; and, by the same means, readjustment of the fractured portions is to be effected. 6. The

Acetabulum may be split; and injury of the neck of the femur may be simulated. There is no shortening of the limb; and crepitus is felt by the finger in the rectum or vagina—when the pelvis is moved, not during mere rotation of the thigh.

Fractures of the Femur.

I. *Fracture of the Neck, within the Capsule.*—This accident is almost peculiar to advanced years; and occurs more frequently in women than in men. The external dense portion of the bone is atrophied, a mere thin shell inclosing the cancellous texture; the neck tends to become rectangular, instead of being oblique, in relation to the shaft of the bone; and there is, besides, the brittleness of the osseous texture peculiar to old age. The accident may be produced by direct violence, as by falls on the hip; more frequently it is the result of indirect violence, as by a slip or stumble, of comparatively trivial amount. The upper fragment remains *in situ;* the lower fragment is drawn upwards by the muscles of the hip, and rests above and on the brim of the acetabulum —farther elevation being resisted by the capsular ligament. Such displacement may not occur immediately, however; not until spastic action of the muscles takes place—it may be, some hours after receipt of the injury; and if the periosteal investment be not wholly torn through, the displacement after all may be but slight. When shortening, to a marked extent, occurs suddenly after some hours, there is reason to infer that the periosteal investment, at first but partially torn, has then given away entirely. By muscular action, also, the lower fragment is everted; the muscles inserted into the trochanteric fossa, inter-trochanteric line, and trochanter minor, especially conducing to this change.

On examination—best conducted with the patient laid straight on his back—the following signs of the injury are observable: There is shortening of the limb, from half an inch to nearly two inches; but perhaps not immediate, as just explained. The toes are everted, and the eversion can be undone by the surgeon, though not without the infliction of much pain. Like the shortening, the eversion may at first be but slight. In some few cases, inversion is found; but that position is accidental; resulting from the nature and direction of the inflicting force, and from absence of the muscular action which ordinarily determines the displacement, and which might have undone the position in which force had first placed the limb. The trochanter is higher and flatter than its fellow. Voluntary motion and power are greatly abridged; forced motion is preternaturally extensive. On rotation of the limb, the hand or ear, placed over the trochanter or on the groin, perceives distinct crepitus; but only when extension has previously been made, so as to bring the fragments into apposition. By gentle extension, the shortening may be undone, and the two heels may be brought together; but on ceasing to extend, muscular action soon restores the shortening as before. On rotating both thighs, the trochanters will be found "moving in the arcs of different circles; that on the injured side rolling on its own axis, while the healthy trochanter describes an arc of

which the neck forms the radius." There is no great amount of swelling; as can readily be understood, when the nature of the injured parts is considered.

It is possible that impaction may take place—the upper fragment being driven into the lower; in which case the shortening and eversion will be slight, and crepitus will be absent unless impaction be undone by extension.

Union of this fracture is quite possible, but yet improbable—especially when the bones are unimpacted. The following are the more important obstacles to such an occurrence: 1. There is an obvious difficulty in maintaining accurate apposition; restraining splints cannot be applied to the part itself, and it is difficult to maintain uniform

Fig. 261.

Fig. 261. Fracture of the Neck of the Femur, within the capsule; thoroughly and accurately reunited. (From the collection of Sir A. Cooper.)

Fig. 262.

Fig. 262. The same. A section showing the line of union.

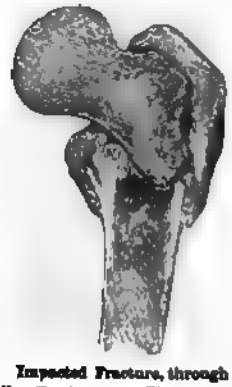
ascendency over the retracting muscles. If the periosteal investment remain partially entire, however, there may be little displacement, and proportionally slight shortening; and, in such circumstances, a better issue may be looked for—as well as in the case of impaction. 2. There must be a want of provisional callus; there being no structure from which it may be produced, and in which it may be formed and sustained; the synovial capsule is obviously barren in this respect. The fractured ends may be said to be steeped in an increased secretion of synovia. 3. Also the definitive callus, which, if uninterrupted, might alone achieve consolidation—as happens in other fractures, when from any cause the provisional formation proves defective—is ever liable to accident, by even slight movement of the parts. 4. The upper fragment, or head of the bone, nourished only through the round ligament, must be of weak power, and ill able to execute the exalted nutritive action necessary for reparation. 5. The age of the patient, and the atrophied condition of the bone itself, are obviously unfavorable to reunion.

With such adverse complications, it is no wonder that examples of union in this fracture are most rare. And yet circumstances may occur, in which that result may be attempted and expected, with every reasonable prospect of success. When, for example, the patient is comparatively young; when the shortening is slight, indicating but partial division of the periosteal investment; or when, besides this, there is absence of crepitus, indicating impaction; when the patient joins heartily with the surgeon in the use of means calculated to maintain apposition, and to prevent all movement of the fragments; and when neither becomes weary of the prolonged period of vigilance required—for, be it remembered, provisional callus is wanting, and the definitive must do all (*Principles*, 3d Am. Ed. p. 658). The ordinary result, however, is the formation of a false joint; the parts becoming accommodated to each other by absorption, connected by new fibrous texture, and farther restrained by a thickened state of the capsular ligament; the limb remaining deformed, and comparatively powerless, yet admitting of tolerable comfort and usefulness, with the aid of a stick or crutch. In the extremely old, fatal sinking is probable; under the shock of the injury, and the irritation of pain and confinement.

In the last-named class of patients, the use of splints and bandaging for retention of the fragments is not expedient. Success cannot result; the annoyance will but aggravate the general disorder; and, not improbably, sloughs will form at the points where the splint exerts its pressure. It is sufficient to arrange the limb comfortably on pillows, and by very gentle swathing or deligation to restrain motion. In the more hopeful cases, the long splint is to be applied as in treatment of the following injury.

II. *Fracture external to the Capsule, and above the Trochanter.*—This is usually an impacted fracture; the upper fragment being driven into the cancellated texture between the trochanters, and more or less firmly wedged there. In such circumstances, there is but little displacement; crepitus, even, may be obscure; and power of the limb, both as to motion and the sustaining of weight, may be wonderfully preserved—continuity in the bone having been restored by the impaction, immediately after it had been dissolved by the fracture. Not unfrequently, however, impaction is not so complete as this; and sometimes it neither does nor can occur, on account of comminution attending on the fracture; and then the amount of displacement and shortening may be very considerable. This form of injury usually results from direct and severe violence, as by falls or heavy blows on the hip. It differs from the preceding; in the mode of occurrence, as just stated; in its liability to occur at any age; in a greater amount of swelling and pain following—the fleshy textures being more or less extensively implicated; in a greater amount of constitutional sympathy being manifested—the injury being altogether more severe; in there

Fig. 268.



Impacted Fracture, through the Trochanters. The upper fragment is wedged into the lower.

being usually a less amount of shortening and eversion, with a greater amount of power and motion; and in crepitus being very palpable only when full extension, and consequent disentanglement, have been effected —obscure, or altogether wanting, until then. When impaction has not occurred, often the slightest motion causes very distinct crepitus; there being comparatively little retraction of the lower fragment. The degree of shortening may be said to vary from half an inch to an inch and a half.

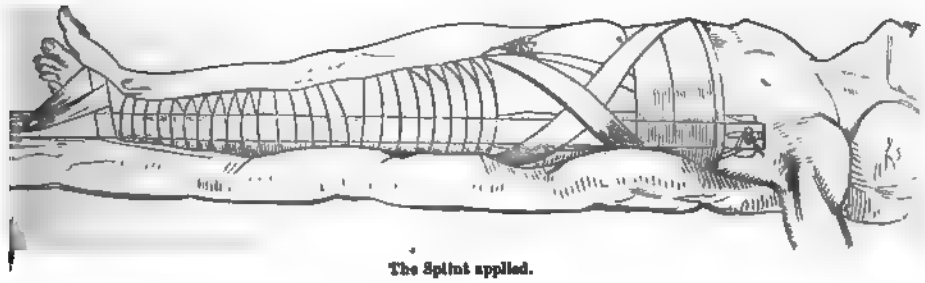
A more important difference exists, in this fracture being capable of satisfactory union. The best mode of treatment is by application of the straight, light, wooden splint. It should extend from a little below the axilla, to a little beyond the ankle, when the patient is straight and

Fig. 264.

Splint, ready for application.

recumbent; and, having been well padded, more especially at the points where pressure is likely to be greatest—at the trochanter, external condyle, and malleolus—it is made one with the limb, as it were, either by bandaging, or by the swathing of a broad linen sheet. Then a soft

Fig. 265.



The Splint applied.

shawl, or other suitable band, is passed beneath the perineum, on the affected side; and has both its ends tied on the upper end of the splint—there being two holes placed there for this purpose. A broad bandage or belt is also applied firmly round the pelvis, so as to bind the splint more securely on the limb, and keep the broken surfaces in apposition. By tightening the perineal band, from time to time, the splint is forced downwards; the splint, having been made of a piece with the limb, brings the latter with it; and thus such extension is made, as is likely to prevent retraction by the muscles, and to maintain the limb of its proper length. Indeed, in practice, it is well to have the extension such as to make a seeming elongation on the affected side. On resumption of the erect posture, and use of the limb, such lengthening soon disappears.

[A modification of the splint originally recommended by Desault, and one which is certainly much superior to it, as well as to that advised in the text, is in common use in this country. It was introduced many years ago by Dr. Physick, of this city. It consists of two pieces of light, but firm wood, one for the outer, the other for the inner side of the limb. The external splint is made long enough to extend from the axilla to four or five inches beyond the foot; the upper extremity may be excavated, like the head of a crutch, and should be broader than the lower, the splint gradually tapering. To the inside of the splint, at the distance of two or three inches from the lower end, is fixed a block, which should be deep enough to project to the line of the middle of the foot, when the splint is applied to the limb. The advantage of this block is that it enables the extension to be made in the normal axis of the leg.

Fig. 266.

The long Splint of Physick's Apparatus.

The inner splint is made of the same material as the other; it should extend from the pelvis nearly to the internal ankle; and, like the first, it should be rather broader than the thickness of the limb from before backwards, of course tapering from above downwards.

Before applying these splints, they should be wrapped in a piece of strong muslin, about two yards long, and as wide as the inner splint; one splint being folded at one end of the muslin, and the other at the opposite, leaving a space between the two boards sufficient to receive, with considerable tightness, the leg and a junk-bag on each side of it. The intention of these bags is to serve as cushions for the protection of the limb, and also as compresses to assist in maintaining the proper extension, in order that the whole burden of the latter may not fall upon the extending and counter-extending bands. The junk-bags may be made of muslin, pretty firmly stuffed with bran; they should be almost or quite as wide, when compressed, as the splints, and should correspond in length with that of the thigh and limb.

The counter-extending band may be made of a strong silk handkerchief, folded like a cravat; or of a long narrow muslin bag, stuffed with bran or cotton, and having a strong tape firmly secured to each extremity.

The extending force may be exerted through a cravat applied upon the foot, as shown in Fig. 267; or through tapes attached to a gaiter made of linen lined with buckskin, cut to the shape of the foot, and secured upon it by lacing, as in Fig. 268.

The apparatus having been thus prepared, the broken limb is carefully placed upon the splint-cloth, between the two splints, or this is gently slid under the member, and the junk-bags are laid one on each side of the latter, as before remarked; the counter-extending band is passed under the upper part of the thigh and over the groin, and its two ends are drawn through holes made in the upper extremity of the long splint, and firmly secured upon the latter; then, while an assistant steadies the

upper fragment and the splint, the surgeon takes hold of the limb by the ankle and the lower fragment, and firmly but gently and steadily

Fig. 267.

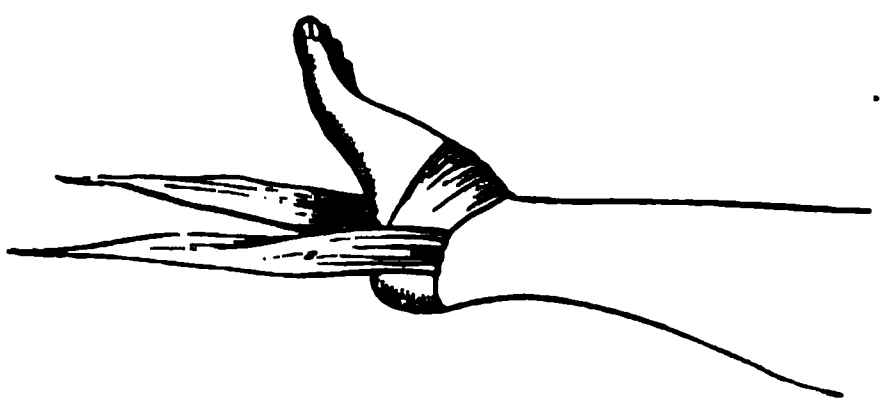
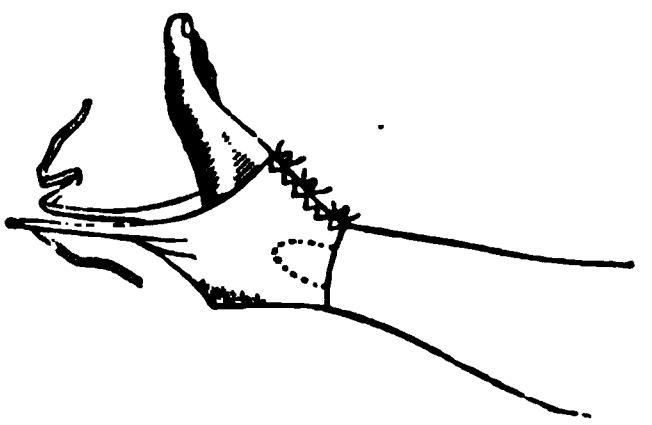


Fig. 268.



draws the latter towards him, his knee, the while, pressed against the end of the long splint; after sufficient elongation and coaptation have been gained, an assistant passes the gaiter-straps over the block and through holes at the end of the external splint, and there ties them tightly; strips of muslin are also tied around the splints, at suitable distances along the limb, in order to compress the soft parts and to aid the action of the extending and counter-extending bands.

The use of the long splint in the treatment of fracture of the thigh is apt to be attended with excoriation or sloughing of the integuments of the foot and also of the perineum, in consequence of the pressure produced at these points by the extending and counter-extending bands. But this is by no means a necessary evil, for it may, in the vast majority of cases, be prevented by attention to proper precautions. Thus, before applying the gaiter or the cravat to the foot, and the counter-extending band to the perineum, the skin covering these parts should be well rubbed with some moderately stimulating liquid, as the spirits of camphor, soap-liniment or whiskey, for the purpose of rendering the skin thicker and more capable of resisting pressure. During the first week of the treatment, these parts should be examined twice daily, and even more frequently if the patient complain of pain or undue itching; and the skin should be rubbed with the liniment, and the extending and counter-extending bands be reapplied in, if possible, a somewhat different position, so that no one point of the integuments shall have to bear pressure for too long a time continuously. Again, in making extension and counter-extension, the requisite traction should be accomplished not through the extending and counter-extending bands, because if these be so drawn upon a dangerous pressure will be exerted upon the skin of the parts involved; but the surgeon should lay hold of the ankle and the lower fragment near the knee, and make the extension while an assistant draws in the opposite direction upon the superior fragment, and when the desired length has been gained the whole limb should be compressed by the forcible lateral approximation of the splints, and then the gaiter and perineal straps should be tied; these are to be used not to make the extension and counter-extension with, but simply as aids in retaining what has been gained by other means.

The patient should be laid upon a hard, level mattress; a bedpan should be used to receive the evacuations from the bowels, or preferably,

a fracture-bed may be employed, having an aperture in the mattress, and in the bedstead, corresponding in situation with the patient's fundament, and closed at pleasure by a firm cushion upon which the pelvis of the individual reposes; when the bowels are to be moved, this cushion is taken away, and a vessel of the proper kind is placed opposite the hole. Thus all undue motion of the body is rendered unnecessary.

Generally, the limbs are allowed to rest parallel with each other upon the bed, or the uninjured member may be moved at the patient's pleasure. But when the fracture is above the upper third of the femur, the broken limb should be drawn out from the middle line, so that the axis of the lower fragment may be made to correspond with that of the upper, which has been acted upon by the abductor muscles; unless this precaution be attended to, an angular deformity will be liable to occur.

Fig. 269.

The American Splint. *a*. The movable crutch. *b*. The screw which fixes the crutch. *c*. The cross-bar, to which the ends of the strap are fastened. *d*. The moving screw.

If proper care be bestowed upon the patient during the treatment of the fracture, a most excellent cure may be obtained by the employment of Physick's splint; and without great care no splint will succeed in curing the injury, except with considerable shortening, and, probably, angular deformity. The editor would not, however, advise its use as an exclusive means. Indeed, he thinks that when the fracture is so situated as that there is decided projection of the point of the upper fragment, in consequence of the powerful contraction of the *iliacus internus* and *psoas magnus* muscles, it will be better to treat the patient upon a double inclined plane, as advised by Professor Miller.[1]—Ed.]

A method of treating fractured thigh has been recently explained to me, by Dr. Kimball, of Lowell, Massachusetts. Two long pieces of strong adhesive strap are applied, one on each side of the limb, extending from above the knee to the ankle, and these are secured by a roller. The end of each strap is uncovered with adhesive matter, and hangs loose from the foot. The splint, as represented in the accompanying diagram, having been applied, the ends of each strap are secured to the cross-bar at the splint's extremity, and the limb is made one with the splint in the ordinary way. By turning the screw, the cross-bar is moved up or down, at will, and extension consequently is regulated with both accuracy and power. The perineal band is employed besides, but should its pressure prove at any time galling, it may be temporarily discontinued

[1] [For farther details concerning the employment of the straight splint, see the Editor's *Treatise on Minor Surgery*.—Ed.]

with safety, the crutch of the splint being moved up into the axilla to supply its place. This splint is the joint invention of Dr. Kimball, and his nephew, Dr. G. K. Sanborn. It seems a most efficient apparatus; and the use of adhesive strap for extension, a method applicable to other fractures, is at once simple and successful.[1]

[It would certainly be unwise to trust to the axilla as a *point d'appui* for counter-extending pressure, for this is not a fixed point, being movable at the will of the patient, and yielding to upward pressure made against it. It would surely be better, in cases where the perineal band cannot be employed, to treat the patient by the double inclined plane; or the apparatus of Hagedorn, as modified and improved by Dr. Gibson, of this city, may be tried.

This apparatus consists of two long splints extending from the axillæ to below the feet, one on each side; at their lower ends they are connected by a footboard, which traverses up and down upon the splints, so as to alter the length of the latter; the footboard is long enough to receive both feet between the splints, and corresponds in depth to the length of the feet. When applied, this apparatus admits the body and both lower limbs of the patient between the splints, while the feet are securely confined upon the footboard by gaiters or cravats; to retain the limbs more completely, bands are passed around the whole, at suitable distances from each other; and junk-bags, similar to those described at p. 650, should be interposed between the limbs, and also between these and the splints, partly for the sake of the patient's comfort, and partly to assist in maintaining the requisite extension.

By this apparatus, counter-extension is made upon the acetabulum of the sound leg, and extension upon the ankle of the injured limb; and it is obvious that, so long as the sound limb is kept perfectly straight (and in order to secure this position the editor has been in the habit of confining it upon a straight splint), and the lateral splints are closely compressed against the body, and the feet properly fastened to the footboard, there cannot be much shortening of the broken leg.

The editor has employed this apparatus in several cases of fracture of the thigh, and has been much pleased with the results of the treatment. For farther details, and an illustration of the splint applied, See *Sargent's Minor Surgery*.—Ed.]

On discontinuing the splint, at the usual time, from four to six weeks, a considerable amount of œdematous swelling generally pervades the whole limb, removable by friction and bandaging. Weight should be placed very gradually on the foot, especially in the aged, and in those of infirm health; for in these, even slinging of the foot, in attempts to walk with crutches, has caused serious displacement of the fracture.

[The editor ventures to suggest, in opposition to the text, that *four or*

[1] This method of dressing fractures has been more particularly brought into notice by Dr. Josiah Crosby, of New Hampshire, U. S. [The employment of adhesive plaster for this purpose was first proposed, there is reason to believe, by Dr. Gross, in his *Treatise on Diseases of the Bones*. The editor has had frequent opportunities of testing its value, and can commend it most highly, as being perfectly reliable for the purpose of extension, and as being free from the objection which applies to the gaiter and the cravat, viz., the liability to excoriation and sloughing which attend their use.—Ed.]

six weeks is too short a time for sufficient consolidation to have occurred to render it proper to dispense with the use of the splints. It is much safer and more judicious to retain them for *ten or twelve weeks*.—Ed.]

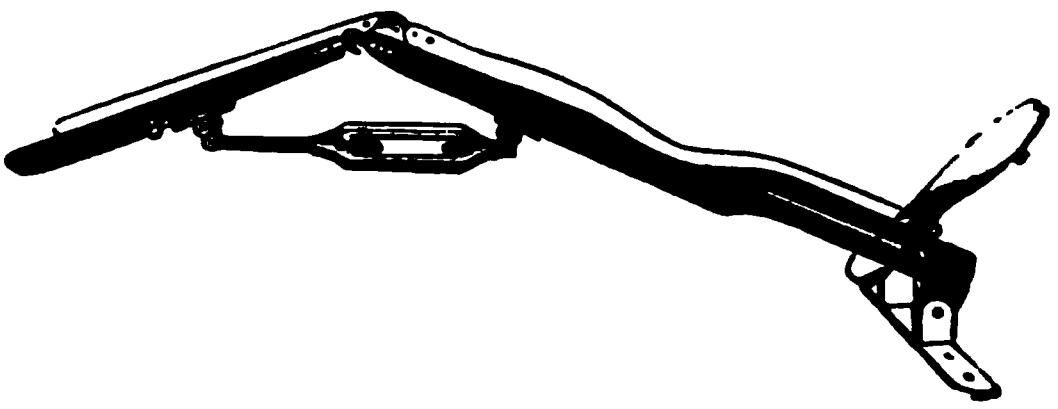
Cases of complete impaction would require little or no treatment, were we content with a permanently shortened limb. But, in order to obtain a perfect cure, it is evident that the impaction must be undone by extension, and the normal length of the limb thus restored.

III. *Fracture through the Trochanters.*—This is also the result of direct and severe violence. There is usually much displacement, and, in consequence, crepitus may at first be obscure. On extension and rotation, the hand, placed over the trochanter, ascertains that the upper fragment is fixed, while the lower alone moves with the thigh. Treatment is by the long splint.

IV. *Fracture of the Trochanter Major.*—This process may be broken off from the shaft of the bone. It is displaced upwards, by the action of the lesser glutæi muscles, and a hiatus can be felt between the two portions. The signs of solution of continuity in the shaft are absent. Accurate approximation and retention are effected with difficulty, and, in consequence, union is generally by ligament. Splints are unnecessary; it is sufficient to maintain recumbency, in such a posture as is likely to conduce to relaxation of the displacing muscles.

V. *Fracture below the Trochanter Minor.*—The indications of this accident are sufficiently plain. The end of the upper fragment is tilted much forwards, by the action of the psoas and iliacus muscles, while, by the muscles of the thigh, the lower fragment is drawn upwards, and usually inwards, the action of the adductors preponderating. The consequent deformity and shortening are great. Extension and rotation cause distinct crepitus, and the preternatural mobility of the part, with loss of continuity in the shaft, are very apparent. Adjustment having been made, by extension and coaptation, the limb may be secured to the long straight splint; and sometimes it is expedient, in addition, to place pasteboard splints directly on the fractured part—one on the inside extending from near the perineum, one on the outside extending from the trochanter major, and both reaching the knee. They are secured by bandaging, before the long splint is applied. But, in some cases, the double inclined plane is preferable—MacIntyre's splint, simplified and improved by Liston (p. 658), the spontaneous rising of the

[Fig. 270.]



[MacIntyre's Splint, simplified and improved by Mr. Liston. (From Fergusson.)—Ed.]

upper fragment being thus humored, while the lower part of the limb is brought up to it. The trunk should also be somewhat elevated, to relax

the muscles of the minor trochanter. In children, it is well to varnish the bandaging, and so to prevent the necessity for frequent renewal of dressings, on the score of cleanliness.

VI. *Fracture of the Shaft near its middle.*—Here the signs of the injury are self-evident, and need not be detailed. Displacement is usually great, and unless this be undone, and permanently opposed, most serious deformity must ensue. The retentive apparatus will consist either of the straight splint, or of the double inclined plane, the latter bent to a tolerably acute angle.

In ill-adjusted cases, not only is deformity great by shortening and bulging at the part; but the knee is apt to become weak and loose, the ligament of the patella proving altogether inert.

VII. *Fracture above the Condyles.*—The lower fragment is usually displaced backwards, by the action of the popliteus and gastrocnemius. The upper fragment, pushed forwards, may penetrate muscles and skin, and so render the case compound. The signs of the injury are obvious and plain. Treatment is by the double inclined plane, with the knee considerably bent.

Fig. 271.

Diastasis of Femur. Reunited.

VIII. *Diastasis*, or separation of the shaft of the bone from its epiphysis, may take place in the adolescent; simply, by direct violence; or with more or less rotation of the detached part, the limb having been twisted by a wheel, or in machinery. Retention is best effected in the straight position; with the use of common splints, of wood or pasteboard; or laying the limb in MacIntyre's splint, fully extended.

IX. *Fracture of the Condyles* may take place, extending into the knee-joint. There is much swelling of the joint, and crepitus is felt on the slightest motion. This is also best treated in the straight position. But watchfulness and activity are especially requisite, to avert inflammatory action, which is apt to seize upon the synovial capsule, and to prove severe. After the first fortnight, to prevent stiffness, gentle passive motion of the joint is expedient; provided the parts are quiet enough to admit of this.

In all fractures of the thigh, the limb's use must be resumed very gradually, crutches being used to bear weight at first, lest bending and shortening occur after apparent consolidation. And this precaution, indeed, is necessary in all fractures of the lower extremity—especially in those enfeebled by age or disease, as already stated.

X. *Compound Fractures* of the thigh, especially at the upper part, are prone to an unfavorable issue; by suppuration and constitutional disturbance. No peculiarities of treatment need be specified; farther than that the patient's fate usually hinges on the prophylactic and antiphlogistic constitutional treatment of the first ten days (*Principles*, 3d Am. Ed. p. 664, &c.).

Fracture of the Patella.

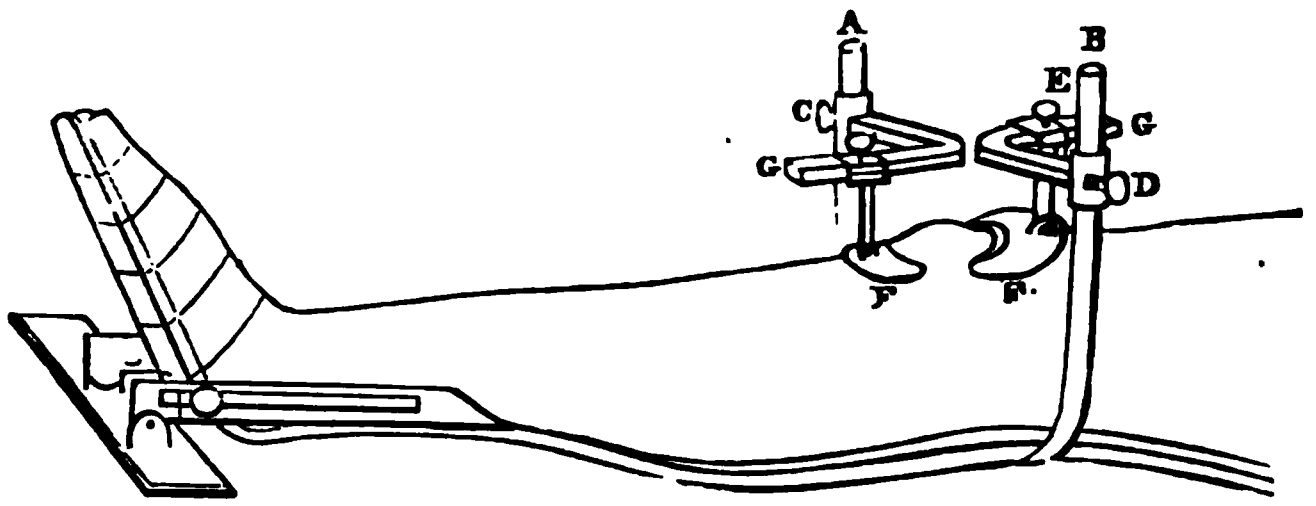
Longitudinal fracture of this bone is the result of direct violence, and may be attended with comminution. Inflammatory action is liable to occur, implicating the joint, and active prophylaxis, in this respect, is in consequence essential. Bony union readily takes place, unless action prove excessive. No complicated apparatus is necessary; it is sufficient to prevent motion, by a short splint under the ham, lightly retained by bandaging.

Transverse fracture is common; the result more frequently of muscular action than of direct injury—as when a person, in full exercise, endeavors suddenly to save himself from falling. In other words, when the knee is bent, and the extensor mass of muscles acts violently, the patella is apt to be broken across, over the condyloid surface of the femur. The lower fragment remains *in situ*. The upper portion is retracted upwards on the thigh, by the extensor muscles, when the severance of fibrous as well as osseous texture is complete, and a wide hiatus is left between, in which the condyloid surface of the femur may be plainly felt, and even seen. The limb is powerless, more especially when descent in progression is attempted, the extensor muscles proving impotent.

Treatment is usually simple, position often being alone sufficient to effect reduction and retention. The limb is straightened and elevated, so as to relax the extensors on the thigh; a bandage is applied, from the toes upwards, to prevent engorgement of the limb, and, if coaptation be not quite complete, the bandaging may be arranged in the form of the figure 8, at the knee, so as to force the fragments gently into apposition. The trunk is also elevated, in a half-sitting posture. Accurate apposition and osseous reunion may be obtained, but this result is not desirable, the knee being apt to prove crank and limited in its movements, and recurrence of the fracture being by no means improbable, under the application of a comparatively slight cause. Short ligamentous union is preferable, affording sufficient firmness and resistance for action of the muscles, leaving the play of the joint unfettered, and proving less liable to recurrence of a solution of continuity. As the consolidation advances, passive motion is gently begun, otherwise the muscles may prove slow in recovering their function.

Should peculiarities of the case render such simple treatment insufficient, and a ligamentous union of redundant length be threatened, more coercive measures are necessary. A broad leather belt is passed round the limb above the patella, another below it; by cross-belts, tightened as circumstances require, the circular girths are brought together, and their approximation includes that of the fragments of the patella. Or Lonsdale's apparatus may be worn, which has the advantage of avoiding constriction of the limb. In cases of non-union, the constant wearing of such an apparatus restores the limb to a great degree of usefulness. Lately a case occurred to me, in which it was found quite impossible to maintain satisfactory apposition of the fragments, on account of a large bulging in the thigh, caused by exuberant callus, the result of previous fracture, ill-adjusted.

[Fig. 272.]



[Lonsdale's Apparatus. A B. Two vertical iron bars, each supporting a horizontal one; these horizontal arms slide upon the vertical bars, but can be secured at any point by the screws C D. To the horizontal beams are attached other vertical rods, which are movable, and yet fixable by screws, as at E. Finally, to each of these last upright pieces is fixed an iron plate, F F, by means of a hinge point, which keeps the patella in place. The foot-piece is movable up and down upon the main body of the apparatus, and can be made fast at any point, so as to adapt the splint to limbs of different length.—Ed.]

Compound Fractures of the patella have generally an unfortunate issue; the joint inflaming acutely, and becoming disorganized. Not unfrequently, amputation is required, to save life.

Instead of the patella giving way, under intense muscular action, the combined tendon of the extensors of the thigh may be torn asunder; causing a hiatus at the injured part, with pain, swelling, and lameness—the power of flexion being alone retained. Treatment is conducted on the same principles as in the case of transverse fracture of the patella.

Fractures of the Leg.

Fracture of the Head of the Tibia is the result of great and direct violence; the fracture extending into the knee-joint. Treatment is as for the analogous fracture of the femur, at its condyles. The limb is placed straight, so that the condyles may act as retaining splints on the fragments; and the limb is also elevated, so as to relax the extensor muscles, which, through the ligament of the patella, act on the lower fragment. Passive motion is expedient, so soon as consolidation has advanced so far as to admit of it.

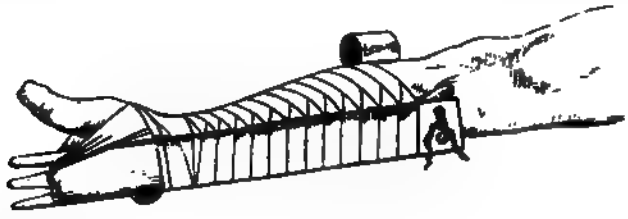
Fracture of the Tibia immediately below its Tubercle.—The peculiarity of this form of injury is, the tendency to rising in the upper fragment, through agency of the muscles acting by the ligamentum patellæ. The rising is aggravated by flexion of the knee. The limb is therefore placed and retained in the straight posture, and elevated.

Fracture of the Tibia, at any lower point, is best treated on the double inclined plane. When this bone suffers alone, there is usually but little displacement; the fibula acting as a restraining splint.

Fracture of the Fibula.—This bone most frequently gives way near its lower extremity, at a short distance above the external malleolus. When force is suddenly applied, so as to cause eversion of the foot—as in twisting the foot, on the side of a stone, or in a gutter—this eversion is resisted by the external malleolus; but if the force be sufficient to overcome the resistance, the bone snaps at its weakest point—from two to three inches above the ankle-joint—and eversion of the foot is effected. There is immediate lameness, and the patient may be sensi-

ble of something having snapped in the leg; the foot is found turned out; and, if progression is attempted, the patient leans on the inside of the foot, so as to support himself on the tibia. A marked depression is observed on the outside of the limb, at the site of fracture; and, on replacing the foot, and making rotatory movement of it, crepitus may

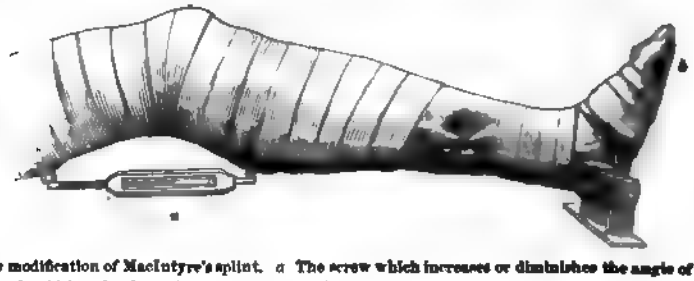
Fig. 273.



Fracture of the Fibula; with the Splint applied. The foot should be more inverted.

be distinctly perceived. The deltoid ligament is ruptured; and the end of the tibia is necessarily displaced, more or less, from the corresponding surface of the astragalus; not unfrequently it is moved forwards on the dorsum of the foot. Treatment is by Dupuytren's splint; a light piece of wood, in breadth proportioned to the limb, and of length sufficient to extend from the knee to a few inches beyond the ankle. It is applied on the inside of the limb; provided with a pad—considerably thicker at the ankle than at the upper part. To a hole at the upper part of the splint a linen roller is attached; and application of this is begun at the ankle—the bandage being occasionally turned over notches made for this purpose in the distal extremity of the splint, so as to maintain complete inversion of the foot, and consequent apposition of the fragments. The more thoroughly the foot is turned in over the malleolar pad as a fulcrum, the more sure are we of accurate readjustment. In effecting reduction, the knee is flexed, so as to relax the

Fig. 274.



Liston's modification of MacIntyre's splint. *a* The screw which increases or diminishes the angle of flexion. at *b*, there should be a knob on the footboard, whereby the foot may be slung. The limb is arranged so as to show the facility afforded for dressing the wound, in the case of compound fracture.

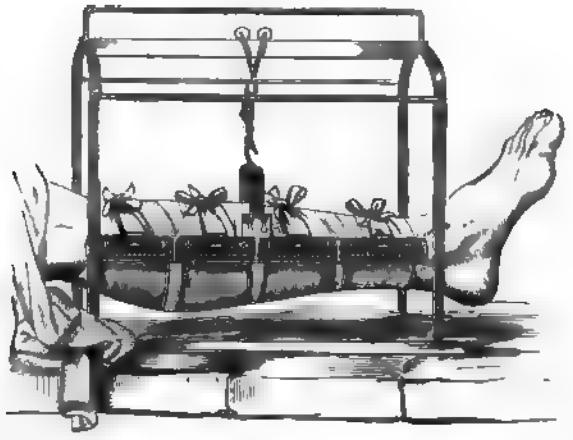
muscles of the leg; and care is taken that replacement of the tibia is effected not only in the lateral but also in the antero-posterior direction.

Fracture of both Bones of the Leg may be the result either of direct

or of indirect violence; a heavy weight falling on, or passing over the part; or the patient falling, and alighting on his foot. In the former case, the fracture is usually transverse, and the bones give way at corresponding points. In the latter case, the fracture is usually oblique, and the bones give way each at its weakest point; the tibia a little above the ankle, the fibula about two or three inches below its head. This latter form of injury is especially apt to occur, in falls or leaps from a vehicle in motion; and one or other of the sharp fragments may protrude through the integument, rendering the case compound. Treatment is best effected by the double inclined plane.

Should pressure on the heel be much complained of, the limb may be laid on its outer side, incased in two pasteboard splints, extending from the knee to beyond the ankle. To prevent such undue pressure,

[Fig. 275.]



[An Apparatus for Slinging a Broken Leg, devised by Mr. Salter, of London. The case in which the leg rests may be made of metal. As represented in the drawing, a swinging motion laterally is permitted; and also a sliding up and down, by the rolling of the pulley-wheels upon the horizontal bar. The frame is made of iron for greater strength. (From Fergusson.)

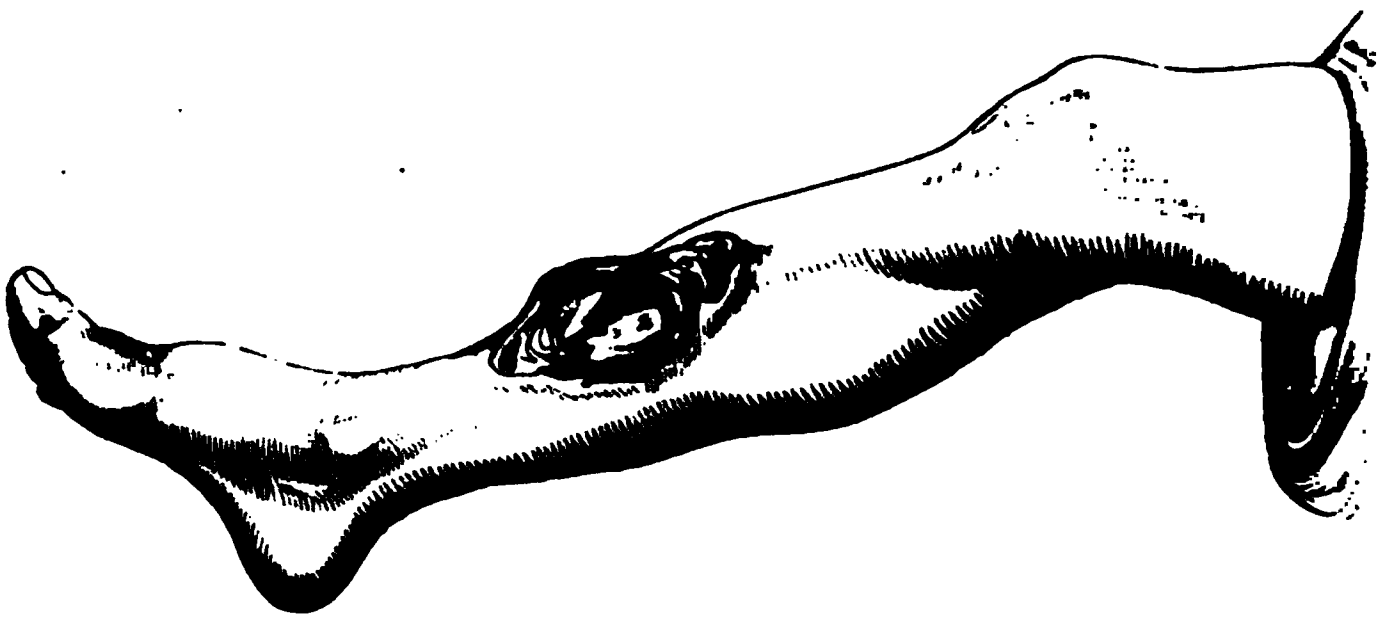
An apparatus for accomplishing the same purpose, and applicable either to the thigh or to the leg, has been used by Dr. Smith, of Baltimore, for many years. It is described by him in the 2d vol. p. 230, of the *Trans. of the Am. Med. Association*.—Ed.]

during the use of the double inclined plane, it is well always, when practicable, to suspend the heel and foot by means of a sock—the end of which is hung, by a piece of tape, on a nob placed for this purpose on the upper and outer part of the footboard. It is also well, in all cases, to have the limb, in its splint or splints, considerably elevated; either by slinging or otherwise.

Compound Fractures of the leg require no special notice. They are, in general, best treated on the double inclined plane; for the wound, being usually either in front or on a lateral aspect, may be completely exposed, and frequently inspected and dressed, without the limb being at all disturbed or the retaining apparatus undone.

[One of the simplest as well as one of the best means of treating compound or other fractures of the leg, is to place it in a *fracture-box*,

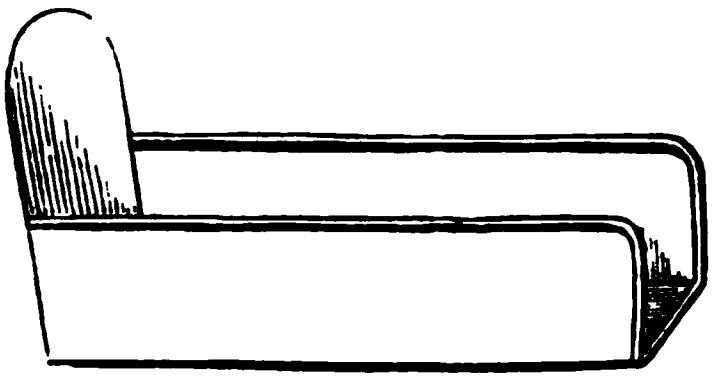
Fig. 276.



Compound and Comminuted Fracture of the Leg.

the sides of which are connected to the bottom-piece by hinges, so that they can be made to exercise, when closed, considerable lateral compression upon the leg. Rectification of the shape of the leg can be secured by the proper position of compresses above and below the fracture. In simple injuries, the limb should be placed upon a pillow; in compound fractures, the box may be filled with *bran*, in which the leg may be buried; thus all the discharge will be absorbed as fast as it is poured out. (See *Sargent's Minor Surgery*.—Ed.]

[Fig. 277.]



Fractures at the Ankle.

The Internal Malleolus may be broken off, by twisting of the foot inwards. The fracture is oblique; the displacement is marked and considerable. The foot is dislocated inwards, presenting its outer edge to the ground. Sometimes, instead of only the malleolus being separated, the fracture includes the whole thickness of the lower end of the tibia, passing obliquely upwards. Replacement having been effected by manipulation, while the limb is flexed, Dupuytren's splint is applied on the fibular aspect of the limb.

The External Malleolus may be detached in a similar manner, by forcible eversion of the foot; but, as already stated, the fibula is more likely to give way at a point somewhat higher—its weakest part. The same splint is employed as in the more ordinary fracture (p. 657).

The Tarsal Bones are occasionally fractured; usually, by intense and direct violence. In general, disorganization is such as to leave no hope of recovery; and primary amputation, consequently, is often required. The *Astragalus*, however, may be split and fissured, by a heavy fall received on the calcaneum; there may be little or no displacement; and a satisfactory issue may ensue. The part is kept steady by lateral splints, or by means of the double inclined plane. Sometimes the tuberosity of the *Calcaneum* is snapped, by the action of the sural muscles. The symptoms and treatment are the same as in the case of ruptured tendo Achillis.

Fractures of the Foot.

Fractures of the metatarsal bones and phalanges are seldom effected but by a crushing force. Their issue is rarely prosperous, especially when compound. The metatarsal bones, after readjustment, require no splints. It is sufficient to keep the foot at rest and elevated. The phalanges, if not demanding immediate amputation, are arranged and retained by small splints, as in the case of the analogous injuries of the superior extremity.

Dislocations.

Dislocation of the Pelvis.

From heavy and high falls, it has occasionally happened that the *Os Innominatum* has been displaced upwards; separated from the sacrum at the sacro-iliac junction, and from its fellow at the symphysis pubis. The following are the diagnostic marks of the injury: The limb of the affected side is shortened and powerless; yet the signs, both of dislocation and of fracture of the thigh-bone, are absent; and the limbs, when each is measured from the anterior superior spinous process of the ilium, are quite of the same length. The spine and horizontal ramus of the os pubis are unusually elevated; forming a hard ridge in the ordinary site of the iliac fossa. The anterior superior spinous process, and the crest of the ilium are on a higher level than those of the opposite side. By examination from the rectum, the tuberosity of the ischium will be found raised, and nearer the mesial line; and the descending ramus of the os pubis will probably be on a plane considerably posterior to that of the sound side. The fold of the nates is higher than on the other side; and, on the injured side of the sacrum, a depression will be felt at the junction of that bone with the ilium. More or less difficulty may be experienced in evacuating the bladder.

Should the nature of the case be distinguished in time, moderate efforts may be made for readjustment; by extension of the limb, and forcing the ilium downwards with the hand. The bladder is relieved by the catheter, as often as circumstances may require; and a flexible catheter is likely to pass more readily than the metallic instrument. The same attention to the state of the internal organs is required, as in the case of fracture of the pelvis. Indeed, fracture of the os pubis is not unlikely to be associated with such an accident. Prognosis is unfavorable.

Separation of the *Symphysis Pubis* is said occasionally to occur, in difficult labor. It may also result from direct injury. Displacement is not great. By a broad belt the parts are kept unmoved, as well as in apposition.

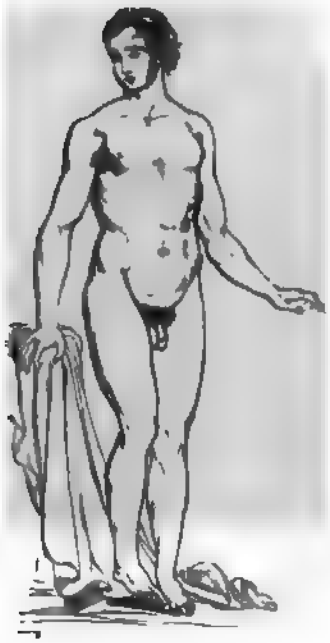
Dislocations of the Hip.

The head of the femur may be displaced, in various directions. The displacing force is usually indirect; but the accident occasionally results from direct blows or falls upon the hip. It may take place at any time

of life; but most frequently affects the young or middle aged adult. In youth it is rare—except in the congenital form (*Principles*, 3d Am. Ed. p. 674); in old age, fracture of the neck of the femur is much more likely to occur.

I. *Dislocation upwards on the Dorsum of the Ilium.*—This is by far the most frequent form of the injury; usually resulting from a fall

Fig. 278.



Dislocation on the Dorsum Ilii.

under a heavy weight. Examination is best made in the erect posture. The limb is shortened, from an inch and a half to two inches; and is turned inwards, the toes resting on the opposite instep, with the knee advanced somewhat in front of its fellow. Motion is much abridged, especially in an outward direction. The trochanter is less prominent than it should be, and is also preternaturally near to the anterior superior spinous process of the ilium. If there be not much swelling, the head of the bone may be felt rolling in its new site, during rotation of the knee inwards. There is also diminution of roundness in the injured hip.

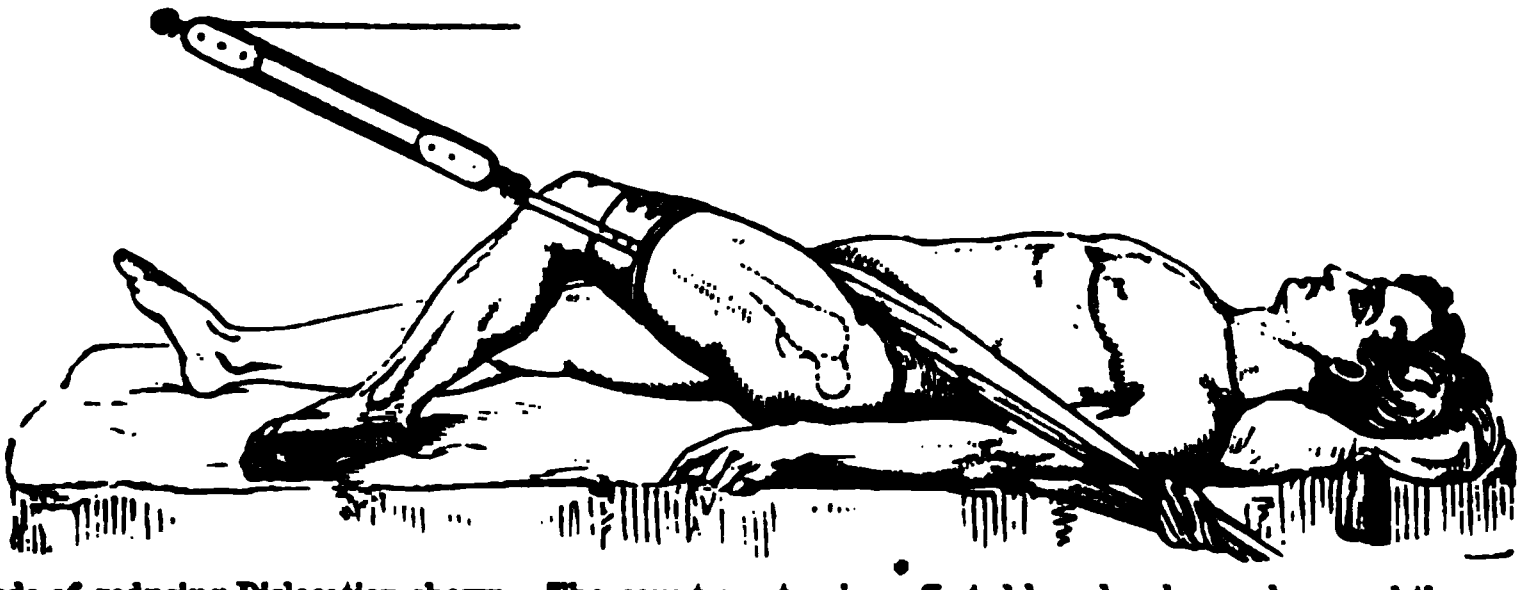
Fracture of the neck of the femur is the injury most likely to be mistaken for this dislocation. Diagnosis rests on the following points: In dislocation, the motions of the limb, both voluntary and forced, are abridged; there is invariably inversion of the foot, and this inversion cannot be undone, until reduction has been effected; the toes may be moved round forcibly, but the whole body turns with them; on extension being made, the normal length of the limb cannot be restored, until reduction has occurred; and then there will be no recurrence of

the shortening, unless fracture of the brim of the acetabulum exist. True crepitus is felt only in the case of fracture. The occurrence of dislocation is much more rare than that of fracture; and, while dislocation may occur at any age, fracture within the capsule seldom if ever is found under the age of fifty. Fracture external to the capsule is at once known by the distinctness of the crepitus—when extension and rotation are made, and when the trochanter is pressed inwards.

Reduction is effected, with or without the aid of pulleys, and their auxiliaries; according to the date of the injury, the robustness of the patient, and the other circumstances of the case (*Principles*, 3d Am. Ed. p. 679). The patient is placed recumbent on his back; and extension is made obliquely across the opposite limb; the thigh crossing its fellow a little above the knee. The laque, to which the pulleys are attached, is applied either above the knee or at the ankle, as the surgeon may prefer (*Principles*, 3d Am. Ed. p. 680). Counter-extension is made, by means of a strong belt—well padded—passed beneath the perineum, and secured to a fixed point behind the patient. When extension has been made for some time, the limb is rotated outwards.

It is seldom that we shall find it expedient to forego the use of chloroform; and when this is employed, no other mode of reduction need

Fig. 279.



Mode of reducing Dislocation shown. The counter-extension effected by a band passed around the upper part of the thigh: the extension, by the pulleys attached to a laque, secured above the knee.

be tried than the simplest—that just stated. But, if anæsthesia from peculiar circumstances be not available, another method may be tried, if the first fail. The patient being placed erect—resting his weight on the sound limb, stooping over a firm table, and having his pelvis fixed securely thereon—the surgeon takes hold of the foot of the affected limb with one hand, and, flexing the leg on the thigh, presses steadily with the other hand on the popliteal space, downwards. After extension has thus been applied for some time, sudden rotation is made on the hip; and the bone may, thus simply, move at once into the acetabulum.

After reduction, the patient is placed gently in bed; and no retentive means are necessary—unless the patient be careless, or violent, by delirium or otherwise. Then it is well to secure the two limbs together, by bandaging, at the knees and ankles; pads being interposed at these points. If, as rarely happens, the upper edge of the acetabulum have been broken, retention is effected with difficulty; and it is necessary to

maintain permanent extension of the limb, by means of a long splint with perineal band, as used in the case of fracture (p. 649).

II. *Dislocation backwards, into the Ischiatic Notch.*—In point of frequency, this form may be placed next in order. "The head of the

Fig. 280.

Dislocation into the Ischiatic Notch.

thigh-bone is placed on the pyriformis muscle; between the edge of the bone which forms the upper part of the ischiatic notch, and the sacro-sciatic ligaments; behind the acetabulum, and a little above the level of the middle of that cavity."[1] The accident results from the application of force, while the body is bent forward on the thigh, and the knee is pressed inwards. The signs bear a general resemblance to those of the preceding injury; but occur in a minor degree. The shortening is from half an inch to an inch. The foot is inverted, and the great toe rests on the ball of the great toe of the opposite foot. The trochanter is behind its usual place, and is slightly inclined towards the acetabulum. The head of the bone can seldom be felt distinctly. The joint is preternaturally fixed; flexion and rotation, in any considerable degree, being quite impracticable. The whole body cannot be straightened in the recumbent posture; if the trunk be smoothed down, the thigh rises up; and if the limb be forcibly and painfully straightened, the loins are found immediately and insuperably arched—and this characteristic will not cease, until reduction has been effected.

Reduction is made with the patient recumbent, on his sound side;

[1] Astley Cooper on Dislocations.

and the affected limb is extended obliquely, so as to bring it across the middle of the sound thigh. After extension has been maintained for some time, the head of the bone is lifted over the margin of the acetabulum, by means of a towel placed under the upper part of the thigh; extension in that direction being made, by passing the loop of the towel over an assistant's neck, while counter-extension is exerted by his hands resting firmly on the patient's pelvis. But it is not to be supposed that such movements are to interfere with the main extending force; the two are carried on consentaneously.

III. *Dislocation downwards, into the Foramen Ovale.*—This—as well

Fig. 281.

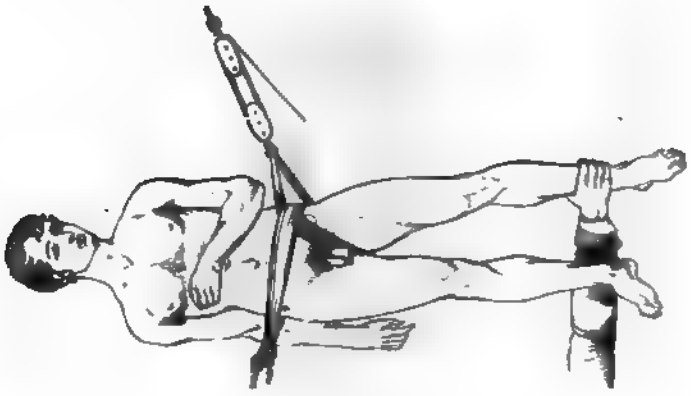
Dislocation into the Foramen Ovale.

as the following variety—is comparatively rare. It is usually caused by a heavy weight falling on the pelvis, while the trunk is bent forwards, and the thighs are separated from each other. The limb is elongated, to the extent of nearly two inches; and is advanced in front of its fellow, the toes usually showing neither inversion nor eversion. The thigh is much abducted, and cannot be brought near its fellow. The trunk is bent forwards, during maintenance of the erect posture; and the tense ridge, formed on the inside of the thigh by the stretched psoas and iliacus muscles, can generally be both seen and felt. The trochanter is flattened and depressed. The head of the bone can be felt—only in thin patients, and in the absence of swelling—by pressure on the inner and upper part of the thigh towards the perineum. The position of the limb somewhat resembles that which attends on the first stage of morbus coxarius; a mistake in diagnosis would be fraught with the most direful consequences; but, with ordinary care, such a misfortune is not likely

to occur. Elongation of the space between the anterior superior spinous process of the ilium and the trochanter major, is of itself a sufficient test of the dislocation.

The patient is placed flatly recumbent; and counter-extension is made across the pelvis, by means of a strong belt passed round it. Extension is applied in the opposite direction, at right angles to the pelvis; the pulleys being attached by means of a loop passed under the upper part of the thigh, and with one portion of the loop passed over the belt,

Fig. 282.



Reduction of Dislocation into the Foramen Ovale.

whereby counter-extension is made. Extension is exerted gradually, until the head of the bone is felt moving from its abnormal site. The surgeon then, passing his hand behind the ankle of the sound limb, grasps the ankle of the dislocated member, and draws it inwards, towards the mesial line of the body. The foot should not be raised, lest the head of the bone slip into the ischiatic notch—a casualty, however, which is far from being irreparable.

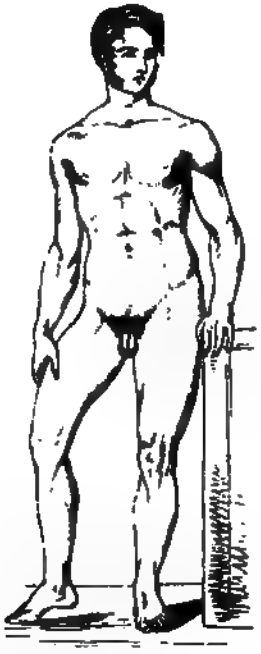
Or, the patient having been placed recumbent, on the sound side, and the apparatus arranged as before, extension is made directly upwards, while the knee and foot are pressed down.

IV. *Dislocation forwards on the Pubes.*—This accident happens when a person, while walking, puts his foot into some unexpected hollow; his body being at the moment bent backwards. The head of the bone is then forced upwards and forwards, on the horizontal ramus of the os pubis. The limb is shortened to the extent of an inch. The knee and foot are turned outwards, and cannot be rotated inwards. The head of the bone may be distinctly felt and seen, forming a globular tumor; resting above the level of Poupart's ligament, on the outside of the femoral vessels; and obedient to the motions of the thigh.

The patient is placed flatly recumbent on a table, with the affected limb projecting over the edge. Counter-extension is made in the ordinary way, by the perineal band—secured behind, and a little above the level of the patient. Extension is made in a line behind the axis of the body,

carrying the thigh downwards and backwards. After some time, the head of the bone is lifted over the margin of the acetabulum, by means

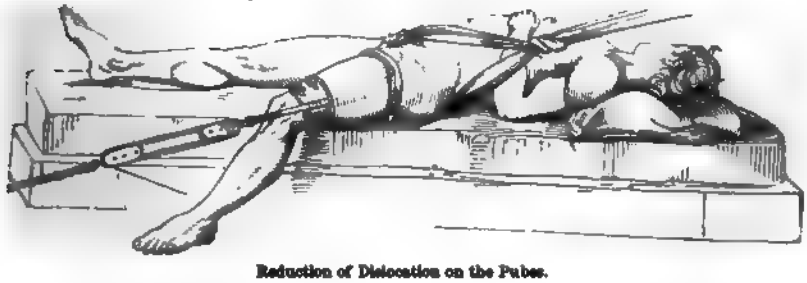
Fig. 283.



Dislocation on the Pubes.

of a towel placed under the upper part of the thigh. And rotation inwards is also likely to be of service.

Fig. 284.



Reduction of Dislocation on the Pubes.

Anomalous dislocations of the Hip.—Besides the ordinary varieties of dislocation, the following have been observed: 1. The head of the femur has been displaced, so as to rest on the anterior superior spinous process of the ilium—or rather on the space between the two spinous processes of that bone, the trochanter major lying on the dorsum; such displacement having been determined by the direct effect of the force,

and muscular action having, from some cause, failed to modify displacement in the usual way. 2. Or, in like manner, the head of the bone may rest on the anterior inferior spinous process of the ilium, the trochanter major lodging in the acetabulum. 3. The head of the bone has been found resting on the tuberosity of the ischium, and also upon the spinous process of that bone.

Dislocations of the Knee.

Dislocations of the knee-joint are caused only by great violence, and are rare. The displacement cannot occur without much disruption of the retaining parts; and, in consequence, replacement is generally effected without difficulty.

The *Tibia* may be luxated from the femur, in four different directions: 1. *Backwards*, behind the condyles of the femur; causing shortening of the limb, prominence of the condyles in front, depression of the ligament of the patella, and bending of the leg forwards. 2. *Forwards.*—The condyles are thrown back, and compress the popliteal vessels; the tibia and patella are elevated in front; the limb is shortened and slightly flexed. These dislocations are complete; the other two are only partial. 3. *Inwards.*—The internal condyle of the femur rests upon the external semilunar cartilage; and the tibia projects plainly on the inner side of the joint. 4. *Outwards.*—The external condyle rests on the inner semilunar cartilage; and the projection is on the outside of the joint.

Reduction is in general readily effected, by extension and coaptation. Antiphlogistics are required subsequently, to ward off or modify the intense inflammatory action, which is apt otherwise to ensue after so serious an injury. The compound luxations usually require immediate amputation.

Gradual displacement of the knee, by muscular action, in the case of advanced structural change, has been already considered (*Principles*, 3d Am. Ed. p. 483).

The Semilunar Cartilages are sometimes displaced, by twisting the joint; as when a person in walking, with the foot everted, strikes the toes against an obstacle; or when the foot, in walking, becomes suddenly caught in a crevice or hole. Perhaps there is a predisposing cause in operation; namely, unusual relaxation of the retaining ligaments of these cartilages. The cartilages are pushed from their normal site, by the condyles of the femur, which then come in direct contact with the head of the tibia. The limb is immediately rendered stiff, and incapable of bearing weight; and a sickening pain is felt. Extreme flexion of the joint, by disengaging the parts, usually suffices for restoration of the normal state; the cartilages, by their elasticity, seeking their own place, when free. The production of such flexion may require force, and is painful. After the joint has remained a little in that position, the limb is brought down again with a sudden movement. The knee remains weak and swollen for some considerable time—perhaps the seat of rheumatic pains; and the use of a knee-cap is expedient. If chronic structural change threaten to ensue, that must be opposed by the ordinary means.

Dislocation of the head of the Fibula is a rare accident.. It may take place, by violence, either backwards or forwards. Reduction is effected by direct coaptation; and bandaging sufficiently effects retention. Should displacement depend on relaxation of the retaining ligament, the pressure of a knee-cap or bandage is necessary; with stimulation of the part, to restore the normal state if possible.

Dislocations of the Patella.

The Patella is liable to be displaced, in various directions; by external violence, applied directly or indirectly. But such accidents are rare. 1. *Outwards.*—This is the most common; and is apt to occur in persons who are knock-kneed. The bone is thrown outwards on the external condyle, and forms a manifest projection there; the knee is incapable of flexion. 2. *Inwards.*—This is the result of direct injury; the bone being struck on its outer side, while the foot is turned inwards. The mal-position is the reverse of the preceding. Reduction in either case is effected by raising the leg, so as to relax the extensor muscles on the thigh, fully; at the same time, with the hand, forcing the bone back to its place.

3. The patella may be displaced by *Semirotation;* one edge resting on the middle of the articular surface between the condyles of the femur, while the other projects beneath the tense integument. Reduction in this case is to be effected by flexing the knee to the utmost; so as to free the bone, and admit of its being drawn into its normal position by the action of the extensor muscles. Should this means fail, it may be expedient to divide the ligamentum patellæ, by subcutaneous incision.

4. The bone can be displaced *Upwards*, only on division of the ligamentum patellæ, by wound or tear. The treatment is as for transverse fracture of the patella (p. 655). 5. Slight displacement, *Downwards*, may follow rupture of the tendon of the rectus muscle.

Dislocations of the Ankle.

I. *Dislocation of the Tibia inwards.*—This, as already stated, usually coexists with fracture of the lower end of the fibula (p. 657). The foot is everted; and the internal malleolus projects greatly. Reduction is effected by extension of the foot; while the limb is bent at a right angle, so as to relax the gastrocnemii muscles. And this flexed position of the leg, be it remembered, is essential in the treatment of all luxations at the ankle. Replacement having been accomplished, Dupuytren's splint is applied on the inner side of the limb; and should it seem necessary, for complete retention, a minor splint may be placed on the outer side also.

II. *Dislocation of the Tibia forwards.*—This, too, attends on fracture of the fibula. It may also occur independently of fracture; but then the fibula is usually displaced along with it; and the case is one of luxation of both bones.[1] The tibia rests on the upper surfaces of the

[1] I have seen the tibia displaced forwards and inwards—the dislocation all but compound, while the fibula remained not only in its place, but entire.

navicular and internal cuneiform bones, and on a small part of th anterior surface of the astragalus. The foot is fixed, and appears mu shortened; the heel is proportionately elongated; the toes are point downwards; there is a marked depression in front of the tendo Achill and the end of the tibia is felt to be resting on the middle of the ta sus. Treatment is as in the former case; a splint being applied on ea aspect of the limb.

A minor form of the injury may occur; the end of the tibia resti partly on the navicular bone, and partly on the astragalus.

III. *Dislocation of the Tibia outwards.*—In this case, the fibula associated in the displacement; and both bones form a manifest pr jection on the outer aspect of the joint. The foot is turned inward its outer edge resting on the ground; and the toes are pointed dow wards. The internal malleolus is obliquely fractured and detache Treatment is as in the other cases. But especial watchfulness is nec sary, as to the consequences; this form of injury being always the resu of much violence, and untoward action being consequently apt to ensu

IV. *Dislocation of the Tibia backwards* is extremely rare. The end the bone rests on the os calcis, in front of the insertion of the ten Achillis; the heel is shortened, and the foot is proportionately elongate

The foot has also been found forced upwards between the tibia a fibula; these having separated. But this may be regarded as merel an aggravation of dislocation of the tibia inwards.

The treatment is still by extension of the foot, during flexion of th leg; and by the application of lateral splints.

V. *Compound Dislocation of the Ankle.*—This is the most comm of the compound dislocations of joints; and usually takes place inward The patient having fallen forcibly, with the foot everted, the end of th tibia is driven through the integuments on the inner aspect of the joint and protrudes to a greater or less extent. Even in extreme cases, th posterior tibial artery generally escapes untorn. This accident m occur to any one; but is especially frequent in adults of advanced yea and intemperate habits; and, in these, but a slight amount of violen would seem to suffice for its infliction. The complication of deliriu tremens is not unfrequent.

Reduction is effected as in the simple form; and subsequent trea ment is conducted according to the general principles elsewhere state (*Principles*, 3d Am. Ed. p. 683). Should anchylosis occur, motion an usefulness are considerably regained, by compensating increase of mov ment in the tarsus. According to the high authority of Sir Astle Cooper, immediate amputation will probably be expedient; "when th ends of the tibia and fibula are very much shattered; when, in additio to the compound dislocation of these bones, some of the tarsal bones ar displaced and injured; when one or other of the tibial arteries i divided, and cannot be secured without extensive enlargement of th wound, and disturbance of the soft parts; when the common integu ments, with the neighboring tendons and muscles, are considerabl torn; when the protruded tibia cannot by any means be reduced; an when the constitution of the patient is enfeebled at the time of the acci dent, and not likely to endure pain, discharge, or long confinement. The amputation suitable is that of the ankle-joint.

Secondary hemorrhage may ensue from the posterior tibial, in a case otherwise affording a chance of cure. In such circumstances, ligature of the superficial femoral may be performed, if all the other points of the case are favorable. But if there be profusion of unhealthy discharge, manifest indication of ulceration in the joint, or signs of incipient gangrene in the wound and on the foot—then amputation is to be performed, with as little delay as possible.

Dislocations of the Tarsus.

I. Of the Tarsal range of bones, the *Astragalus* is the most frequently displaced by violence. Its dislocation may be either complete or partial; and it may take place in various directions. 1. *Forwards.* This is by far the most frequent form. When the ankle is fully extended, a large amount of the upper articular surface of the bone is exposed; and if, by a fall, a powerful shock should then be applied to the calcaneum, the astragalus is very apt to be loosened and displaced—forwards and inwards—coming to rest on the navicular bone. Sometimes the displacement is forwards and outwards; the bone resting on the os cuboides. The nature of the accident is at once declared, by the manifest appearance of the astragalus in its abnormal site. Reduction is to be attempted by persevering extension of the foot, with the leg flexed; while the bone is pushed backwards to its place. And, with the aid of chloroform, we shall not despair of success in all recent cases (*Principles*, 3d Am. Ed. p. 735).

If the luxation have been complete, and remain unreduced, tension of the integument will be such as to render sloughing inevitable at the tense part; and the case so becomes compound. Then, three modes of procedure are open to the surgeon; to retain the parts as they are, and endeavor to bring them through the risks of open suppuration: to perform amputation at the ankle; or to excise the displaced bone, and hope to save both the limb and the joint. The last is usually to be preferred. Primary amputation is unnecessarily severe; and the first mode is declared by experience to be hopeless of a successful issue. When, therefore, the case is from the first compound, when it ultimately becomes so by sloughing or ulceration of the strained and bruised integument, and also when the circumstances are such as to render it plain that sloughing or ulceration must soon occur—the luxated bone is to be removed by incision, the limb is to be carefully adjusted, retention is to be maintained by the adaptation of suitable splints, and the case is then to be treated as a compound dislocation of the ankle-joint. In partial displacement, no such severity is ever necessary; in complete luxation, it may not be required; but in a luxation which is both compound and complete, and in complete luxation which is certain to become compound, such treatment is certainly preferable to the greater severity of immediate amputation—as well as to the perils of profuse suppuration, constitutional suffering, and the almost certain prospect of secondary amputation, which must follow an attempt to retain the bone.

Fig. 285.

Compound Dislocation of the Astragalus. (Sir A. Cooper.)

2. The astragalus may be dislocated *backwards;* becoming firmly wedged between the tendo Achillis and the posterior surface of the tibia. The bone is readily felt in its unnatural site; it is seen protuberant there; and the end of the tibia is felt projecting in front. Reduction, for obvious reasons, must be difficult. In only one case, probably, has the attempt ever proved successful without chloroform; one which occurred to Mr. Liston.[1]

3. The astragalus has been displaced *upwards;* wedged between the tibia and fibula. But this accident is extremely rare.

4. Dislocation has taken place *outwards;* and it has also taken place *inwards.* Such injuries are usually not only compound, but also complicated with fracture of one or other malleolus. They may be so severe as to demand immediate amputation at the ankle; or they may admit of replacement of the limb, in the hope of saving it, after the dislocated bone has been removed.

II. *The Os Calcis and Astragalus* may be separated from the other bones of the tarsus; the foot becoming displaced inwards, as in talipes varus. Reduction and retention are easy; the former by extension and coaptation; the latter by placing the limb on the double inclined plane, and securing the foot firmly on the footboard.

III. *The Cuneiform bones* may sustain displacement. Of these, the internal is most likely to suffer. The bone projects inwards, and is also drawn upwards by the action of the tibialis anticus. Reduction will be difficult. But, after a time, the limb may become little less useful than before, even though the displacement remain unreduced.

Dislocation of the Metatarsus.

One or more of the metatarsal bones may be displaced upwards on the front of the tarsus, the foot having undergone a severe wrench, as by a fall from horseback while the foot is retained in the stirrup. Under chloroform, the parts are easily reduced, and no retentive means are necessary. Leeching, with other antiphlogistics, will probably be required, however; such displacement not being likely to occur without the infliction of much violence.

Dislocation of the Toes.

Luxation of the phalanges of the toes is rare. Reduction is readily effected, by extension and coaptation. Compound luxations usually require amputation.

[1] Lancet, July 6, 1839.

Subluxations and Sprains of the Lower Extremity.

The hip is seldom sprained. The knee suffers not unfrequently. The twist is usually such as to strain the inner aspect of the joint; and there the ligamentous apparatus may partially give way. Pain is great and sickening; much swelling ensues, perhaps involving the synovial capsule; and the part is apt to remain weak, and prone to recurrence of the injury. In addition to the ordinary treatment suitable for sprain (*Principles*, 3d Am. Ed. p. 686), the wearing of a knee-cap is essential for some time, until the part, by consolidation, regain its power of resisting the more ordinary applications of force.

Sprains of the ankle are extremely common; by twisting the foot, by a fall, or by a "false step." The most ordinary sprain is caused by twisting the foot inwards; and the consequent pain and swelling are on the outside of the foot—often great over the belly of the short extensor of the toes. Treatment is by rest, fomentation, leeching, &c. And an elastic bandage on the ankle is necessary for some time after walking has been resumed.

Injuries of the Tendo Achillis, and Gastrocnemius Muscle.

Rupture of the Tendo Achillis.—By sudden and violent exertion of the sural muscles, as in leaping, dancing, or running—more especially if the patient be muscular, advanced in years, and unaccustomed to such exercise—the tendo Achillis is apt to give way, close to or at its insertion into the calcaneum. There is immediate lameness; the patient falls, and is quite unable to resume the ordinary erect posture; much pain is complained of in the part; and, on manipulation, a very palpable gap is found at the site of injury. Usually there is, at the time of rupture, a sensation of something having given way; sometimes there is an audible snap; not unfrequently the patient complains of having been struck at the injured part, although no blow has been sustained there. Treatment is simple. Position alone suffices for replacement. The leg is bent, and the foot is extended, so as to relax the sural muscles completely, and favor approximation. This position is maintained by simple means. A slipper is placed on the foot; to the heel of the slipper a stout cord or tape is attached; and this is fastened to the thigh, by means of a circular belt applied there—or to the

Fig. 286.

Outline of Limb, showing the slipper and ligature useful for maintaining flexion in ruptured tendo Achillis.

loins, in a like manner—as tightly as is necessary for securing the requisite degree of flexion. Bending may be voluntarily increased by the patient; and this does no harm. But extension is absolutely prevented. Reparation is slow (*Principles*, 3d Am. Ed. p. 688); and the period of confinement requires to be extended a week or two beyond that required in the case of fracture. After consolidation, extension is made gradually, lest the uniting medium be over-extended, and disruption of it ensue. The patient, when first allowed to move about, with a crutch or stick, is provided with a high-heeled shoe; and, every day or two, a thin slice is cut from this heel, so as to permit a gradual approach of the sole to full planting on the ground.

Wound of the Tendon is managed in a similar way. Accidental wounds—as by a scythe, knife, or reaping-hook—are usually compound. And in them the cure may be facilitated by approximating the two portions of tendon by means of suture.

Ununited Tendon.—Cases sometimes present themselves in which rupture of this tendon has not been repaired. The retracted portion has become rounded off; the calcaneous portion is similarly changed; and the space between is occupied by dense deposit, quite inefficient for restoring function to the muscles. The hiatus being considerable—perhaps to the extent of two inches or more—the limb is quite useless in progression. To remedy this state, an incision may be made, the rounded ends of the tendon may be cut off, and approximation may be effected by suture. But this is severe practice. I have lately applied, quite successfully, the principle of subcutaneous section (*Principles*, 3d Am. Ed. pp. 671 and 688); by a stout needle making raw the extremities of the tendon, and breaking up the intervening space completely; so restoring the parts to a resemblance of their condition immediately after the original injury; applying the same simple, retentive, and approximating apparatus, as after recent rupture; and, after consolidation, employing the same caution in permitting resumed use of the limb.

Laceration of the Muscle.—Instead of tendon giving way, the muscular fibres of the gastrocnemius may yield. The laceration seldom implicates more than a few of the fibres; and the site of injury is usually where the muscular fibre ceases and tendon begins. The causes are the same as those of the former injury; the symptoms are very similar, and the treatment is identical (*Principles*, 3d Am. Ed. p. 687). Sometimes it is the plantaris which yields in either its muscle or tendon.

For Bibliographical reference, see p. 332.

CHAPTER XLI.

AFFECTIONS OF THE FOOT.

Talipes.

By this term is understood the deformity of *Clubfoot;* generally congenital, yet not unfrequently acquired. The original development of the bones is not faulty; but displacement of these is gradually effected, by a predominance of action in certain muscles; such predominance being dependent, either on spasm of those which so act, or on want of action in those which ought to be their antagonists. There is no actual dislocation of the tarsal bones; there is merely gradual change in their relative positions. A case is related by Delpech which well illustrates the mode of production. A soldier had "the external popliteal nerve injured by a shot;" the peronei, the tibialis anticus, and the extensor

Fig. 287.

Fig. 287.—Talipes Equinus.

Fig. 288.

Fig. 288.—Talipes Equinus after division of the tendo Achillis.

muscles became paralytic in consequence; and, from the unopposed action of the opponents of these muscles, clubfoot resulted.[1]

There are varieties of this deformity.

[1] Little. Introduction, p. 85.

I. *Talipes Equinus.*—The muscles of the calf are contracted; the tendo Achillis is rigid; the patient steps on the toes without bringing the heel to the ground; the foot is, in other respects, well-formed; but the extensor tendons being on the stretch, there is a turning up of the toes, independently of that which is caused by pressure in progression.

Fig. 289.

Fig. 289.—Talipes Varus.

Fig. 290.

Fig. 290.—The same dissected; showing the altered relative position of the bones.

II. *Talipes Varus.*—This is the most common variety; consisting of extension, adduction, and rotation of the foot—the rotation being analogous to supination of the hand. The muscles of the calf and the adductors of the foot are contracted; the heel is drawn up; the toes turn inwards; the outer edge of the foot rests on the ground; and, in progression, weight is borne on the outside of the foot and on the outer ankle, where adventitious bursæ usually form of some size. The toes are extended, as in the former case.

III. *Talipes Valgus* is the reverse of the preceding. There are abduction, rotation, and partial flexion of the foot; the rotation being analogous to pronation of the hand. The front of the foot is raised from the ground; and the patient rests on the inside of the instep, and on the inner ankle. The tendons of the peronei muscles are chiefly to blame.

IV. *Talipes Calcaneus.*—The muscles in front of the leg are contracted; the foot is extremely flexed; and, in progression, the heel alone touches the ground.

One foot, or both, may be affected by Talipes. In the former case, the affected limb is found thinner and more flabby than the other; and, sometimes, by arrest of development, it is shortened as well as weak. The mode of progression is painful and imperfect. And, not unfrequently, contraction takes place at the knee, to a greater or less extent.

Spurious Talipes is said to occur, when displacement of the foot

takes place by muscular change or integumental contraction, following on burns, extensive suppurations, ulcers, &c.

Treatment of Talipes.

In the minor cases, which occur in children, mechanical means—early employed, skilfully adapted, and duly persevered with—are alone sufficient to effect a normal relation of parts. Many such cases occur; and it is quite unnecessary to subject the little patients to the pain of tenotomy.

When the deformity obviously depends on a paralytic condition of certain muscles—as is more likely to be the case in the acquired than in the congenital examples—attempts may be made to obviate this condition, by remedies directed both to the system and to the part. Attending to the nervous centres, to the chylopoietic viscera, and to the general functions—we may find the symptoms yield, as in the analogous affection of strabismus. And the local means most likely to be of service are, blistering, the endermic use of strychnia, galvanism, exercise, friction, and passive motion.

Tenotomy is had recourse to, when structural shortening of muscle, of tendon, or of both has occurred; and when the obstacles to replacement cannot otherwise be overcome. A large number of cases are so circumstanced. The operations, however, are but part of the remedial means; and will certainly fail, unless suitable apparatus be afterwards employed, well and sedulously. Instead of waiting for reunion of the tendons, and then extending their new bond of union, painfully and slowly, it is better to effect the required change of relative position immediately after section; leaving the interspace to be filled up by new matter. In the congenital form, the operation may be had recourse to about the twelfth or fourteenth month, when the patient is just beginning to walk; the mechanical and general remedial means having been in use previously. Extreme cases in the elderly adult should be regarded as irremediable. Tenotomy will fail to effect a cure; and may do harm, for a time at least, by impairing very seriously the acquired usefulness of the limbs.

In Talipes Equinus, division of the tendo Achillis is usually sufficient. In Talipes Varus, division of this tendon may suffice, along with the use of mechanical aid. But, very frequently, it is necessary also to divide the tibialis posticus and flexor longus pollicis. In confirmed cases, the tibialis anticus, and extensor proprius pollicis must be added to the list. In Talipes Valgus, the peronei are divided along with the tendo Achillis. In Talipes Calcaneus, the tibialis anticus is cut, along with the extensors of the toes.

The tendo Achillis is divided a little above its insertion into the calcaneum. The patient having been placed in a prone position, the limb having been steadied, and the foot having been bent, a tenotomy knife or needle is introduced obliquely; and, by bringing its edge or point on the rigid tendon, the fibres are cut from without inwards; an assistant flexing the foot forcibly, so as to assist in the disruption. This having been completed, the instrument is withdrawn, and a compress is

applied to the aperture. Or division may be reversed; from within outwards; but there is thus a risk of accidentally wounding the integument. The tibialis posticus may be divided, either above the ankle, or near its insertion in the navicular bone. The tibialis anticus is divided in front of the ankle; from below outwards, so as to save the joint. The flexor longus pollicis is divided, where felt tense, in the sole of the foot. Sometimes it is expedient to divide the plantar fascia also; from below outwards, to save the important textures beneath. The peroneus longus and peroneus brevis may be divided above the external malleolus, or near their points of insertion; the rest, at such points as circumstances may render apparently the most suitable. As a general rule, in such operations, the knife is moved away from, not towards, arteries and nerves.

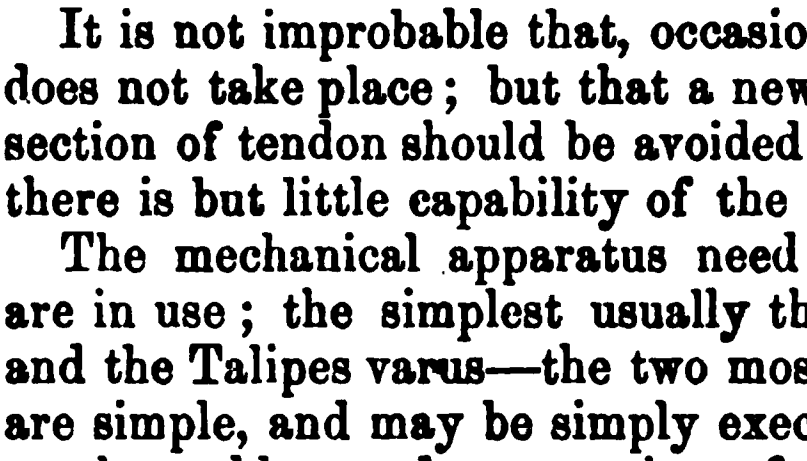
It is not improbable that, occasionally, reunion of the divided tendon does not take place; but that a new attachment is formed. Obviously, section of tendon should be avoided within thecæ; as, in such a locality, there is but little capability of the expected plastic exudation.

The mechanical apparatus need not be described. Many varieties are in use; the simplest usually the best. For the Talipes equinus, and the Talipes varus—the two most common varieties—the indications are simple, and may be simply executed; flexion of the foot, by acting on the ankle; and restoration of the normal position of the foot, as regards rotation and abduction, by acting on the foot itself.

Flat-foot.

Young adolescents, of delicate health, and exposed to considerable exertion on the feet, are liable to serious lameness from sinking of the arch of the tarsus; apparently in consequence of relaxation of the connecting ligaments. The arch of the foot is lost, the tibia projects inwards, the foot turns out, the ankle is apt to swell, and progression is slow, awkward, difficult, and painful. The deformity affects both sexes, and all classes; excited, in the poor, by overwork; in the rich, by absurd eversion of the feet, and overtasking of the limbs, in attempts to impart polite accomplishments to these organs. In most cases, a state of system very similar to the strumous will be found. By discontinuance of the exciting causes, by friction, by bandaging and the wearing of a roborant plaster on the part, and by general tonic treatment, relief is obtained. It is well also to have the sole of the shoe, or boot, considerably thicker on the inner than on the outer side. And, if matters do not advance favorably, an apparatus may be worn, which will both support the ankle and invert the foot. Sometimes, the young patient, in the process of farther development, recovers both symmetry and usefulness.

Fig. 291.



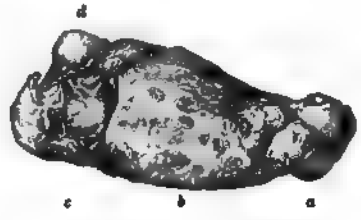
Flat-foot.

In confirmed cases, both deformity and lameness are great. "The peronei and anterior muscles of the foot obtain a preponderance, and eversion of the foot becomes ultimately as considerable as in true talipes valgus. The preponderating muscles undergo structural shortening; the outer margin of the foot, and even sometimes the front of the foot generally, is raised from the ground; and locomotion is effected to a considerable extent on the heel. The gastrocnemii then waste, and the gait becomes very unsightly." Such cases are to be treated as examples of Talipes. Tenotomy is required, with the subsequent use of rectifying apparatus. And the tendons which require division are, the tibialis anticus, all the peronei, the extensor proprius pollicis, and the extensor longus digitorum.

Podelkoma.

This has been elsewhere described, as a form of multiple ulceration peculiar to the foot (*Principles*, 3d Am. Ed. p. 254). By others it has

Fig. 292.



Podelkoma, or morbus tuberculosus pedis. *a*. The toes, much altered. *b*. The outer side of the foot, in some parts showing cicatrices. *c*. The line of amputation at the ankle. *d*. The astragalus. The swelling is often much greater than here represented.

been noticed as *morbus tuberculosus pedis*.[1] The milder forms may be remedied by pressure and constitutional alteratives; the advanced cases generally result in amputation.

Corns and Bunions.

These painful affections are the result of pressure, exerted by ill-constructed shoes and boots. They are more easily prevented than cured. 1. The shoe or boot should be large enough to contain the foot easily; and an allowance should be made for the occasional swelling to which the part is liable by exercise, heat, and a dependent position. 2. The sole should be at least as broad as that of the foot. The outline of the foot—represented on a piece of paper, on which the patient leans in the erect posture—should be the measure of the sole of the boot or shoe. 3. The boot or shoe should be square, or, rather, rounded in front; not sharp, with the point nearly in a central position. The point corresponding to the end of the great toe should be nearly in a line with the inside of the instep. And abundance of room should be given for

[1] Godfrey, Lancet, No. 1187, p. 593.

each toe to occupy its own place, without any crowding, or overlaying of its fellows.

Corns consist of two parts. A thickening of the cuticle, and a hypertrophied and irritable condition of the corresponding papillæ of the true skin. The inflammatory process may supervene. And then a small abscess may form; very painful, because the matter is confined by the dense cuticle; and frequently leading to smart erythema or erysipelas of the foot. Corns are also said to be Soft and Hard. The former situate on the outer points; the latter placed between the toes, where there is naturally considerable moisture. Another division of corns is into the Laminated and Fibrous. In the former, hypertrophied cuticle is arranged in a laminated form; and there is uniform enlargement of the papillæ beneath. In the fibrous, the central papillæ are much enlarged and project; each is surrounded by a sheath of epidermis; and, consequently, while the circumference of the corn is laminated, the central portion presents a fibrous appearance. And, in ordinary language, these projecting papillæ are termed the "roots of the corn."

The indications of cure are simple. 1. To remove the cause, by wearing suitable boots and shoes, or by leaving the part altogether unfettered for a time. 2. By careful dissection, to remove the hardened and hypertrophied cuticle; and, by repetition, to prevent reproduction. 3. To remove the irritability, and to restore a normal state of the cutis vera, by occasional application of the nitrate of silver. 4. If inflammation have occurred, poulticing, fomentation, and rest are suitable. And the subsequently open state of the parts is taken advantage of, so that a free and effectual use of the nitrate may be made. 5. Inveterate cases are palliated, by wearing roomy and soft shoes and boots; also protecting the corns, by means of thick plasters, which are excavated opposite the tender points. And into the excavations, it may be well to insert, occasionally, extract of belladonna, or some other anodyne substance.

Bunions are formed thus: 1. Inordinate pressure has been habitually made, by boot or shoe, on the ball of the great toe. The skin, consequently, becomes congested and tender; and the part is red and swollen. This is one form of the affection; remediable by abstraction of the cause, by rest and fomentation, and by a subsequent light use of the nitrate of silver, or of a solution of iodine. 2. Or an adventitious bursa forms over the joint, and enlarges gradually. Occasionally, it may show an unusual size, by reason of bursitis. The remedies for this form are—abstraction of the cause, discutient applications in the chronic stage, antiphlogistics in the acute. A thin caoutchouc envelop is sometimes of service, by equalizing the pressure of the shoe. 3. Or, in consequence of repeated attacks of bursitis, the cyst suppurates, and opens externally: the aperture becomes fistulous; the cyst contracts, but continues to discharge fluid, more or less; and acute accessions are ever liable to occur. In this case it is necessary to destroy the cyst, by inserting a piece of potass into the cavity. Afterwards, the granulating sore is brought to heal under the ordinary means—rest, and simple applications. 4. There is an aggravated class of cases in which there is enlargement of

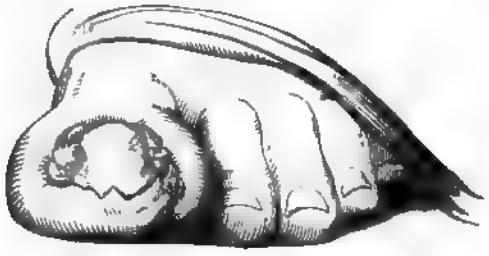
the osseous texture. Blistering and rest may make some favorable impression. By suitable adjustment of the shoe, palliation is obtained. 5. The joint may be partially displaced, in the rheumatic and gouty adult; the toe riding over its fellows, and pointing to the outer side of the foot. This, too, can be but palliated.

Onyxis and Onychia, Exostosis, and Contraction of the Toes.

Onyxis and Onychia require the same treatment as when affecting the fingers. The great toe is the especial site of Onyxis (p. 300).

Exostosis of the Distal Phalanx of the Great Toe is a troublesome affection, not unfrequent in occurrence. Sometimes the growth takes

Fig. 293.



Onyxis, affecting the Great Toe.

place from the plantar aspect of the phalanx; but much more frequently from the dorsal; elevating the nail, causing pain, and seriously interfering with progression. Excision is performed, by means of a strong knife, or by cutting-pliers; and, should any reproduction threaten, during cure of the remaining wound, the chloride of zinc is applied. Should excision fail, amputation of the phalanx is had recourse to (*Principles*, 3d Am. Ed. p. 451).

Fig. 294.

Exostosis of Distal Phalanx of Great Toe.

Contraction of the Toes.—The toes, more especially the one next the great toe, are liable to extreme contraction, whereby considerable deformity is produced, the wearing of boots and shoes is rendered painful, and the functions of the foot are interfered with. Subcutaneous section of the extensor tendon usually permits sufficient restoration of the normal position. But it is not uncommon to find amputation of the offending toe expedient; other means having proved unavailing, and the patient being himself anxious for a summary procedure.

Little on the Nature and Cure of Clubfoot, &c. London, 1839. Tamplin, Nature and Treatment of Deformities, London, 1846. Bishop, Lectures in the Lancet, 1846. Weis, de Tenotomia Talipedibus applicata, Havniæ. 1844. Durlacher on Corns, Bunions, &c. London, 1846.

CHAPTER XLII.

AMPUTATION.

MUTILATION by removal of a limb, or part of a limb, is the last resource of our art; and ought never to be had recourse to, until it is evident that other means either have proved or must prove unavailing. The profession have reason to rejoice that necessities for the performance of amputation are much less frequent than in former times; yet the circumstances are not few—and in all human probability never will be few—in which nothing but the sacrifice of a part of the body will suffice for the retaining of existence. We are constrained to amputate; in spreading gangrene, as speedily as possible, if there be a sound space in which to make our incisions; in chronic gangrene, when the line of separation has been formed, and is advanced; in tumors which are of a malignant kind, and involve a bone or joint; in diseases of the joints, which have baffled our skill, and have caused urgent hectic; in cases of recent injury, when it is evident that the parts are so far mutilated as to render recovery impossible; and in cases of attempted preservation of limbs, after injury, when it is plain that farther continuance of the attempt must be attended with unwarrantable peril of life. Not unfrequently, also, a partially recovered limb proves so stiff, useless, and inconvenient, as to urge the possessor to seek its removal; and such operations of *complaisance* are not always to be declined.

In the case of injury, amputation is either primary or secondary; the former, when done immediately, after the system has emerged from the state of shock, and before it has become involved in febrile excitement; the latter, when performed after febrile accession has occurred, and when—it may be after some weeks—life is threatened by excessive suppuration, disease of bone, disease of joints, or sloughing of the soft parts. The comparative merit of primary and secondary amputation is still, with some, a disputed point. The question has already been considered (*Principles*, 3d Am. Ed. p. 631). For its decision, a mere comparison of statistical details is obviously insufficient; for, in one class are necessarily included all the most severe cases, while the other contains many of a very minor character.

The two chief objections to the primary operations, are: 1. Two shocks may overpower a patient, who might have rallied successfully from one. To this it is answered, that the operator must choose his time skilfully; not bringing the two shocks into immediate contact; but waiting until the former has wholly passed away; and not operating at all, unless a sufficient rally shall have taken place. It is seldom that a patient perishes of mere sinking, after amputation. And besides,

by the use of chloroform—an agent which is seldom dispensed with in amputations nowadays—it is to be remembered that the shock is very much modified, and a positive tolerance of the operation seems to be imparted to the system (*Principles*, 3d Am. Ed. pp. 715). 2. It is alleged that a robust state of body—in which the patient may be, at the time of the accident—is less favorable to recovery than the comparatively reduced state which obtains after subsidence of the inflammatory fever. This objection obviously can be removed, by judicious antiphlogistic treatment of the case. Not unfrequently, inflammatory fever, and its results, afford no opportunity to judge of the expected favorable condition for secondary operation; the patient dying during the inflammatory period.

But we would rather refrain from the discussion in this place; and would simply repeat the practical rule, on which the great majority of surgeons are agreed—That, when an injury has been sustained by a limb, of such a character as to render it impossible, in the opinion of the surgeon, that the part can be retained; when, in other words, it is obvious that amputation must be performed at some period of the cure—it is better to amputate at once, so soon as the system has rallied from the primary shock; preferring to encounter the minor risk by rapid succession of a second shock, rather than to meet the more perilous invasion of intense inflammatory action, with its serious consequences to both part and system.

Another question, scarcely yet arranged, is as to the comparative merits of the old circular method of operation, and of the modern operation by flaps. In this part of the country, the latter is tacitly preferred; recourse to the circular method being quite the exception to

Fig. 295.

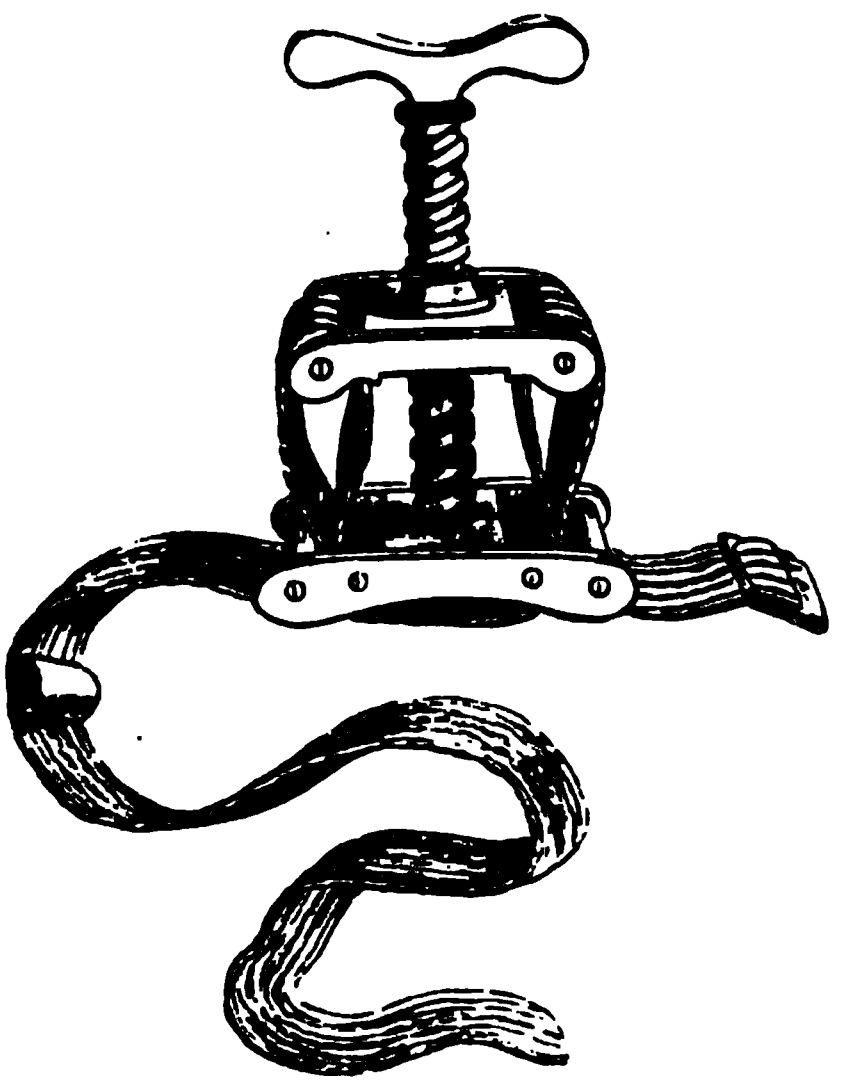


Fig. 295.—The Tourniquet, unapplied; but with its two platforms as much separated, as if in actual use.

Fig. 296.

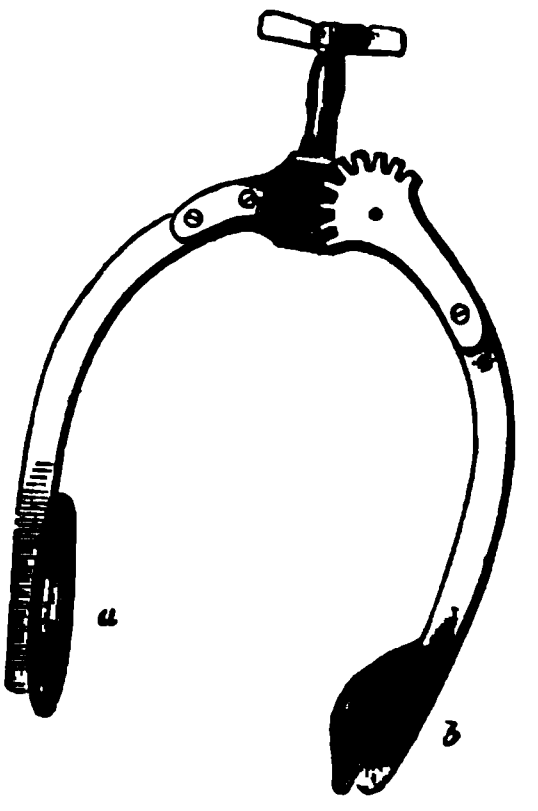


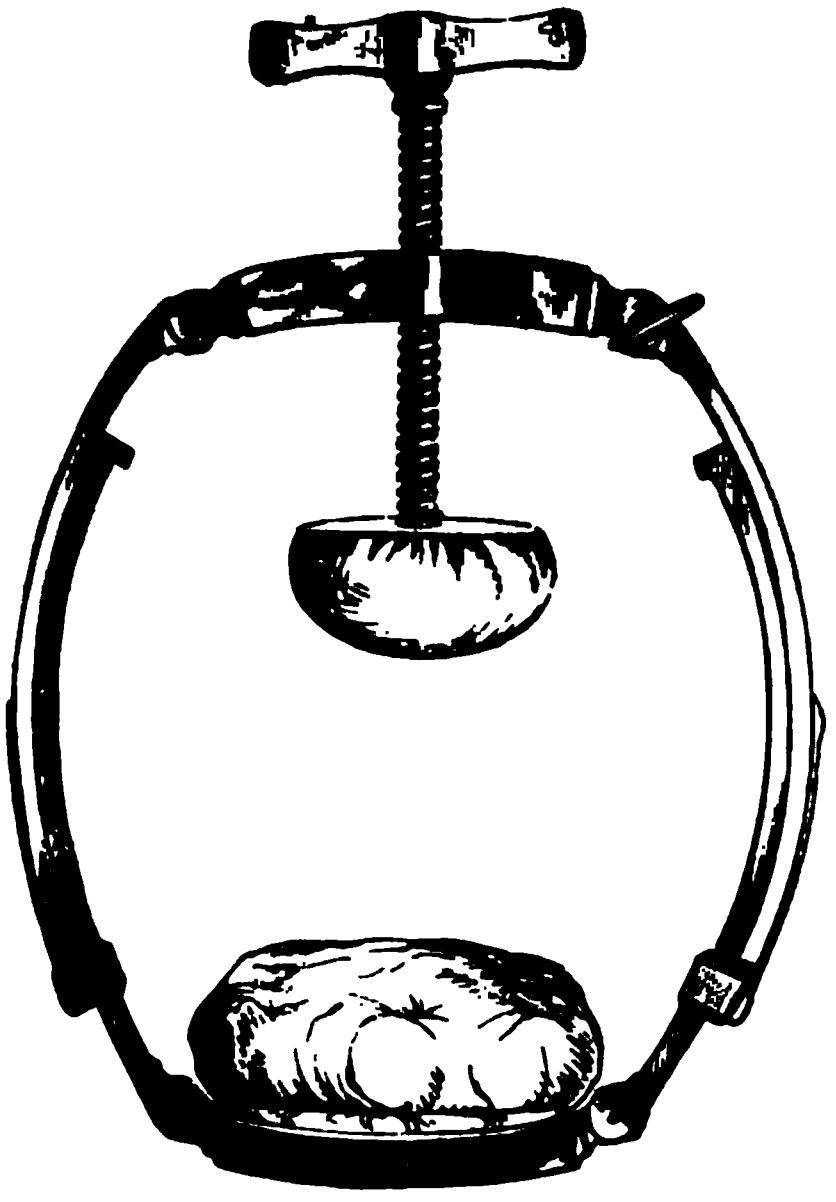
Fig. 296.—Signoroni's Compressor. *a*. The point of counter-pressure. *b*. The pad which acts directly on the vessel.

the general rule of operating. And the obvious advantages are; more rapid performance; a cleaner cut; a better covering to the end of the bone; and a power of selection, as to what parts shall constitute the covering. The vessels are cut obliquely, no doubt; but, if the ligatures be applied carefully—as they always ought to be—there is no risk of secondary bleeding on this account (*Principles*, 3d Am. Ed. p. 349).

In temporarily restraining hemorrhage, during the incisions, the hands of an assistant are usually preferable to any tourniquet; as has already been explained (*Principles*, 3d Am. Ed. p. 342). And pressure is not applied until the knife has begun to penetrate; in order that no unnecessary loss of blood may be occasioned, by venous congestion beneath the site of compression.

[Mr. Skey has contrived a tourniquet, which seems to be a very good one, having the merit of being susceptible of firm attachment around the limb, without interfering with the venous circulation. It is represented in the accompanying drawing. It is composed of two semicircles, one of which moves upon the other in a groove, and may be fixed at any point by a spring-catch, so that the circle may be enlarged or diminished to suit limbs of different sizes. The pressure is made upon two points only, the rest of the circumference of the member being untouched (*Skey's Op. Surgery*, Am. Ed. p. 313).—Ed.]

[Fig. 297.]



Mr. Skey's Tourniquet.

In the Flap Operation, the following are the more important points of detail. The patient is arranged comfortably recumbent, on a firm table, of convenient height for the operator; who places himself on the left of the patient, so that his right hand may be used, freely, for the incisions. The sound limb is held steady, and out of the way, by an assistant; or is secured by a towel—in the case of the lower limbs—to a leg of the table. Ordinary assistants are ready to control the motions of the patient, to reassure him, if need be, and to minister to his wants. An experienced administrator undertakes the whole charge of the chloroform, from the beginning to the end of the operation; never allowing himself to be distracted by the details of this from a close and uninterrupted watching of the patient. A trustworthy assistant is ready to command the hemorrhage, by the pressure of his own fingers, or by that of a tourniquet. Another is prepared to retract the flaps, and to tie the arteries. A third is stationed to hand what things may be re-

quired; and these are suitably arranged on an adjoining table—tourniquet, bandage, lint, ligatures, sutures, knives, saw, cutting-pliers, artery-forceps, sponges—chloroform. If necessary, an assistant, seated in front of the patient, steadies and supports the limb to be removed.

Fig. 298. Fig. 299.

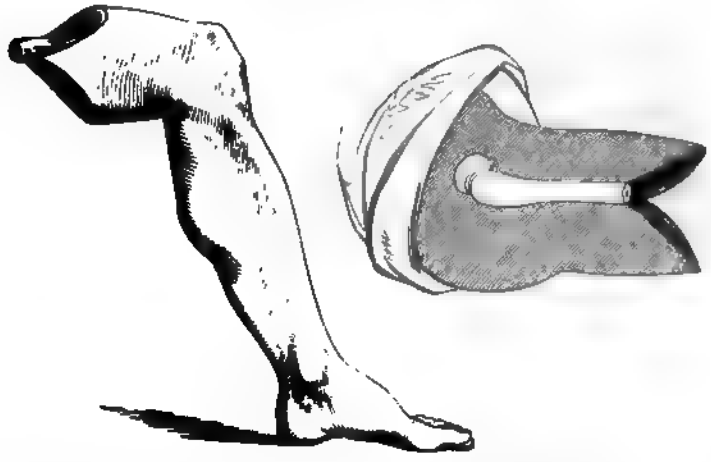


Fig. 298.—The Flap Operation. Illustrated in the Thigh. The sloping wounds, whence the Flaps have been taken, shown in the amputated part.

Fig. 299.—The Corresponding Stump; intended to exhibit the comparatively small extent of wound that remains; in contradistinction to Fig. 301.

Suppose that the thigh is to be amputated by double flaps. The surgeon grasps the flesh in front of the limb with his left hand, so as to raise it from the bone; thereby facilitating the making of a full flap anteriorly. As the knife's point is about to enter, pressure is applied to the femoral. Transfixion is made, by pushing the knife down to the centre of the bone, horizontally; gently passing the point round the bone to the front; then pushing across, so as to make the point of exit as nearly as possible opposite to that of entrance. Moving the knife downwards and outwards, with a gentle sawing motion, a sufficient flap is formed anteriorly, and this is retracted by the assistant; or, rather, is simply elevated. The knife's point is then re-entered, about an inch beneath the site of former transfixion; in order to avoid cross-cutting of the integument, which is otherwise apt to occur. And, the second transfixion having been effected, a second flap is formed posteriorly. This is quickly laid hold of by the assistant's other hand; and he now retracts both flaps; pulling steadily, and keeping his own fingers out of the way. The surgeon, by circular sweeps of his knife, divides the soft parts completely, as high as the fleshy commissure of the flaps will permit; effecting this leisurely and coolly, in order that it may be done thoroughly. Not even a shred of periosteum should be left at the point which is to be sawn; and this should be as close to the adherent cushion of muscle above, as the instrument can be made to go. The form of the wound—the flaps unretracted—is conical; and the sawn end of the bone must occupy the very apex of the cone.

The assistant continuing to keep the flaps out of harm's way, the

saw is applied to the isolated portion of bone—the side of the instrument lying close upon the fleshy wall above. The saw is held perpendicularly, and is "grooved" by drawing it lightly from heel to point. By steady sweeps, section is effected; the surgeon, meanwhile, controlling the lower limb with his left hand; making sure that it is not held too high, so as to lock the saw by shutting it up in its own groove; and taking equal care to prevent its being too much depressed, so as to favor splintering of the bone when the section is nearly completed. During, and after the use of the saw, the assistant takes care to apply no traction to the flaps, lest the periosteum be unnecessarily stripped upwards. Should this happen to any considerable extent, necrosis and exfoliation may scarcely fail to ensue. Should any roughness remain on the end of the bone, either by splintering or from natural construction, this is to be removed by means of the cutting-pliers.

Attention is now immediately directed to the arteries; the largest being at first secured. Each is laid hold of with the artery-forceps, and, by being pulled outwards, is separated from all surrounding textures; partly to insure deligation of the arterial coats only; partly to secure application of the ligature beyond the oblique section of the vessel. By neglect of this, nerve and vein may be unnecessarily injured; and the ligature's noose, traversing the oblique section, not going beyond it, may leave a part of the arterial mouth still open, and ready to afford a troublesome hemorrhage. So soon as the larger arteries have been secured, the assistant relaxes his pressure above, or altogether removes it. The smaller vessels can be quite commanded by the finger-points; and, were the high pressure continued, venous loss of blood must necessarily ensue. Removal of the pressure, above, is usually sufficient to arrest the venous flow. But, should this continue, direct pressure is made, either by the finger applied to the venous orifices, or by shutting the flaps and pressing them firmly together, for a short time. Deligation of a vein is unwarrantable (*Principles*, 3d Am. Ed. p. 354).

Bleeding having been satisfactorily arrested, the flaps are partially approximated by a few stitches; and, a wet cloth having been applied to the line of wound, the patient is removed to bed. The subsequent treatment is conducted according to the principles formerly described (*Principles*, 3d Am. Ed. p. 593, *et seq.*); our object generally being to obtain adhesion; yet, not unfrequently, preferring a moderate suppuration—as when the system has been long previously subjected to copious discharge, the sudden arrest of which might seriously endanger the internal organs (*Principles*, 3d Am. Ed. p. 490).

The *Circular amputation* is performed thus; again supposing the thigh to be the part concerned. An assistant, grasping the limb with both his hands, draws up the skin as far as possible. The surgeon, holding the knife lightly, and with his arm at first placed under the thigh, divides the skin and areolar tissue in one continuous sweep. The assistant now retracts the skin, more decidedly than before; and he is assisted in this, by the surgeon touching the subcutaneous tissues at various points with the knife. Close to the retracted integument, the knife is again laid on; and, by a second sweep, the superficial muscles

are divided. These are pulled upwards by a retractor—a portion of linen or leather, slit at one end; and, by a third sweep of the knife, laid on close to the retractor, the bone is made bare. Retraction is then applied to all the fleshy textures; touches of the knife assisting

Fig. 300.

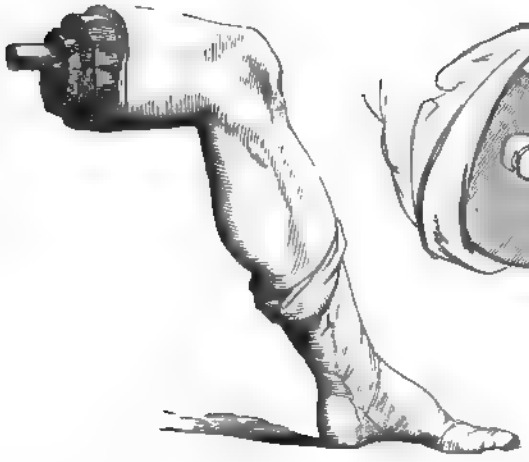


Fig. 300.—Circular Amputation, illustrated in the Thigh. The terraced arrangement of the wound, shown in the amputated part.

Fig. 301.

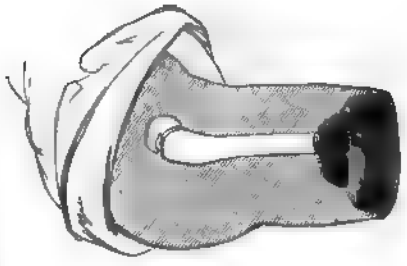


Fig. 301.—The Corresponding Stump; intended to exhibit the comparatively large extent of wound that remains; in contradistinction to Fig. 299.

to expose the bone at a higher point; and, this having been reached, complete isolation of the bone is effected there. The saw is applied, while by the retractor the muscles are protected from injury. Bleeding having been arrested, the soft parts are let down, and are arranged so as to make the line of wound rectilinear.

Amputation of the Fingers.

Amputation at the Distal and Middle Joints is performed thus. An assistant controls bleeding, by grasping the wrist tightly. Another separates the fingers from that which is doomed; at the same time steadying the hand in a pronated position. The surgeon lays hold of the finger, slightly bending the joint at which removal is to take place; and the articulation is then laid open, by a sweep of a narrow straight bistoury. Division of the lateral ligaments is completed, if need be, by the point of the instrument; and the joint is more flexed, to favor disarticulation. This having been effected, the knife's blade is placed behind the head of the bone; and, by cutting downwards and outwards, a sufficient flap is formed on the palmar aspect. Previously to disarticulation, the surgeon lays hold of the part on its dorsal and palmar aspects; in making the flap, his hold is lateral. Or the procedure may be reversed. The hand being placed in a state of supination, transfixion is made in front of the joint; by cutting downwards and outwards, the flap is made in the first instance; and then, by a sweep of the knife,

disarticulation is effected, and the integuments on the dorsal aspect are divided. Usually, no hemostatics are required. The flap is turned over

Fig. 802.

Amputation of the Finger, at the Distal Articulation.

the joint; and is retained in its place, by a single point of suture, or by bandage or strap alone.

The Proximal phalanx, if not wholly involved in injury or disease, need not be entirely sacrificed. Amputation may be performed near the middle of the bone; in obedience to the general rule, of saving as much as possible of the organ of prehension. A stump of the fore-finger is especially useful. By transfixion, on the palmar aspect, a long flap is formed there; and a small semilunar flap of integument is made on the dorsal aspect, by a subsequent sweep of the knife. Or corresponding flaps may be made on the sides of the finger; in cases of external injury, when the palmar aspect is much mutilated. The bone, having been made bare at the upper part of the wound, is severed by cutting-pliers. And in using this instrument care is taken to place its smooth side always where the stump is to be; otherwise, splintering and irregularity are apt to occur. Hemorrhage having been arrested, the flaps are united and retained in the ordinary way.

Amputation at the Metacarpal Joint may be performed in one of two ways. The hand is held pronated. 1. The finger, well separated from its fellows, is laid hold of by the surgeon, and pushed to one side. On the exposed and tense web, the bistoury is passed upwards, from point to heel, so as to expose that side of the articulation; at the same time, leaving on its outer side a flap of suitable dimensions. With the knife's point, disarticulation is effected; the finger being pushed much across to facilitate the process. Were the blade to be used for this purpose, ragged wounding of the integument could not well be avoided. The head of the bone having been detached, the blade of the knife is placed behind it; and, by cutting obliquely outwards, a second flap is formed, to suit the former—while at the same time, detachment of the finger is completed. 2. Or the knife's point is entered on the centre of the knuckle; and, by one continuous movement, is carried round the finger, so as to make two equal, lateral, semilunar flaps, at the same time exposing the joint. Disarticulation is then completed, and the part removed. The digital arteries usually require ligature. Approxima-

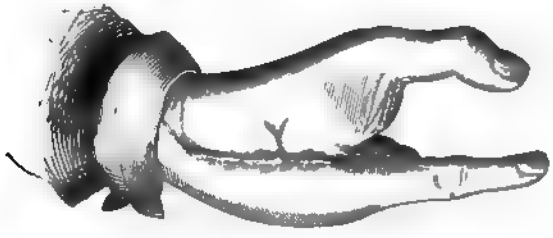
tion is effected by bringing the two adjoining fingers together, and retaining them so by means of a slip of bandage. Cold pledgets of lint are applied; and, otherwise, the wound is managed in the ordinary way (*Principles*, 3d Am. Ed. p. 593, *et seq.*).

When operating on the fore and little fingers, it is well to extend the incisions a little upwards, to expose the head of the metacarpal bone, and to remove its articulating surface by means of the cutting-pliers. The stump is more rounded, and has a more seemly appearance after cicatrization, than when the end of the metacarpal bone is left projecting. But, in doing this, care must be taken not to injure the transverse ligament.

Amputation of the Metacarpal Bones of the fingers is sometimes required; in consequence of disease affecting one or more of them. The incisions vary, necessarily, according to the extent of the disease, and the site of the openings already existing. Disarticulation from the carpus requires both skill and caution. The fingers are taken with the metacarpal bones; for, the former become useless appendages, when deprived of their support. If in amputating a finger and its metacarpal bone, the corresponding carpal surface be found in a carious state, by the use of a gouge the diseased parts may be removed; and the progress of cure may prove most satisfactory.

Disease or injury of three metacarpal bones, does not warrant removal of the whole hand. The stump which results from amputation of the

Fig. 303.



Stump of the Hand, in which the thumb and little finger, with their metacarpal bones, were left alone, after amputation on account of injury by a printing machine. The thumb and finger acquired great mobility and power, and the stump proved most serviceable.

affected parts only, is infinitely more serviceable than that which follows complete mutilation.

When the lower part, only, of a metacarpal bone is affected, disarticulation at the carpus is not attempted, but section of the bone is made in its shaft, by means of the cutting-pliers. The knife is entered on the dorsal aspect, at the point where section is to be made, and is carried down in the mesial line, till the knuckle is reached; there a divergence is made, on either side, as in amputation of the finger only, but without passing the knife so deeply as to open the articulation. Then, by dissection, the diseased portion of the bone is isolated, care being taken to leave the palm entire.

Also, when a single metacarpal bone is removed entire, it is well to

spare the palm, the hand being afterwards both more useful and more seemly than it otherwise would be.

Amputation of the Metacarpal Bone of the Little Finger is accomplished thus: The finger is laid hold of, and separated from the others; and the bistoury, laid on the stretched web, is carried up at once, along the inside of the metacarpal bone, to its articulation with the unciform bone of the carpus. The doomed part being much pushed ontwards, disarticulation is effected with the point of the knife. And then, the blade having been placed behind the base of the bone, a suitable flap is formed on the outer side, by bringing the knife downwards and outwards, causing it to emerge a little below the metacarpal articulation. Hemorrhage having been arrested, the flap is accurately adjusted to the raw metacarpal surface, and retained in the usual way.

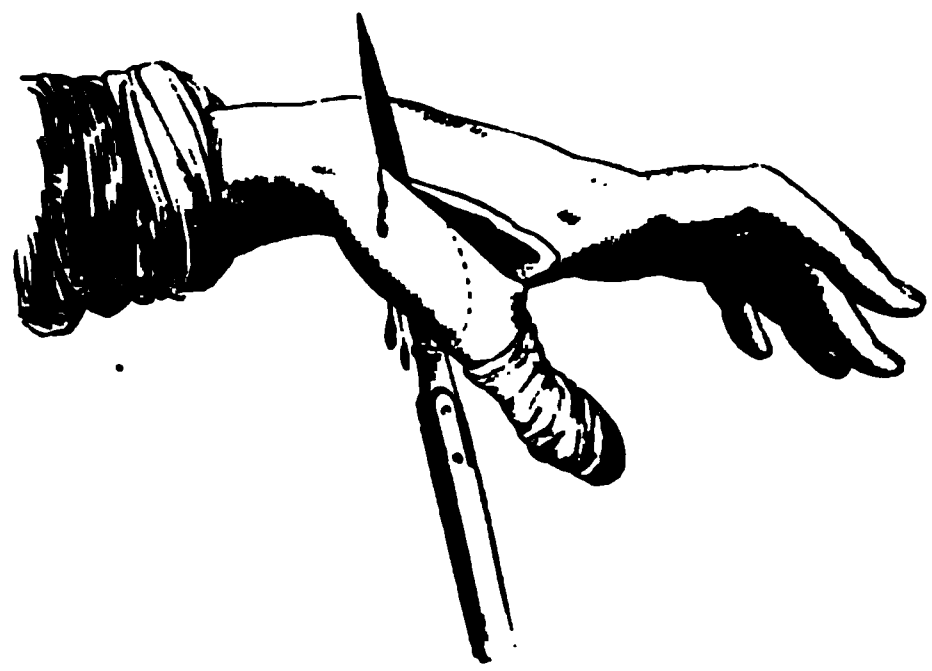
Or the flap may be made in the first instance, by transfixing at the carpal articulation, and carrying the knife downwards and outwards, as before; or, by marking out the flap with the knife's point, and dissecting it up, cutting from without inwards. One obvious advantage of this mode of operating is, that, should the base of the metacarpal bone be found not diseased, it may be saved; instead of disarticulation, the bone is cut across by the pliers.

Amputation of the Thumb.

The phalanges of the thumb are removed in the same way as the phalanges of the fingers.

Amputation of the Phalanges, with the Metacarpal Bone, may be effected in the same way as removal of the little finger and its meta-

Fig. 304.



Amputation of the Thumb and its Metacarpal Bone.

carpal bone, by placing the bistoury on the web between the thumb and forefinger, passing it up to the articulation with the trapezium, disarticulating there, and forming a suitable flap by bringing the knife down on the opposite side of the bone. Or, by transfixing at the articulation with the trapezium, and making the flap in the first instance; afterwards effecting disarticulation, isolating the bone, and removing the member. Or the flap may be made by dissection upwards. Or

the bistoury may be entered over the trapezium, and carried down on the dorsum of the metacarpal bone, having reached the distal extremity of this bone, it may be swerved to the inside; thence it may be made to transfix the ball of the thumb, emerging where it first entered; and, by cutting outwards and downwards, the flap may be constructed.

Amputation of the Wrist.

Hitherto, pressure on the wrist has sufficed temporarily to restrain hemorrhage. Now, compression of the humeral is expedient; and is best effected by the firm and steady grasp of an assistant—on the lower part of the arm—the nerves being excluded from pressure as much as possible.

Fig. 305.

Amputation of the Wrist.

Hitherto, also, a narrow, straight, sharp-pointed bistoury has been the preferable instrument, for making the incisions. Now, a regular amputating knife is required. An exaggeration of the former instrument, in a fixed wooden handle; straight, sharp-pointed, and of fine edge and temper; light yet firm. The amputating case contains various sizes; proportioned to the dimensions of the parts which may require their use.

For the wrist, the shortest size will suffice; the blade not much larger than that of a full-sized bistoury. The arm is steadied, with the hand in a state of pronation. The knife is laid on below the styloid process farthest from the operator—who stands on the patient's left—and is carried across the limb so as to form a semilunar wound on the dorsal aspect, whose centre extends as far as the second carpal range, and whose termination is below the styloid process on the side next the surgeon. An assistant retracts the flap thus formed. The wrist is bent, and disarticulation effected. The blade of the knife is then laid behind the carpus; and, by cutting outwards and downwards, a suitable flap is formed on the palmar aspect. In the last part of the proceeding, the pisiform bone is to be avoided; and, in endeavoring to escape from it, care must be taken not to notch the corresponding portion of integument. The radial, ulnar, and interosseous arteries, require ligature.

Amputation of the Forearm.

Pressure being made on the humeral, the limb is steadied, with the hand in a state of pronation. Two flaps are formed; one on the dorsal, the other on the palmar aspect. Below the middle of the forearm, it

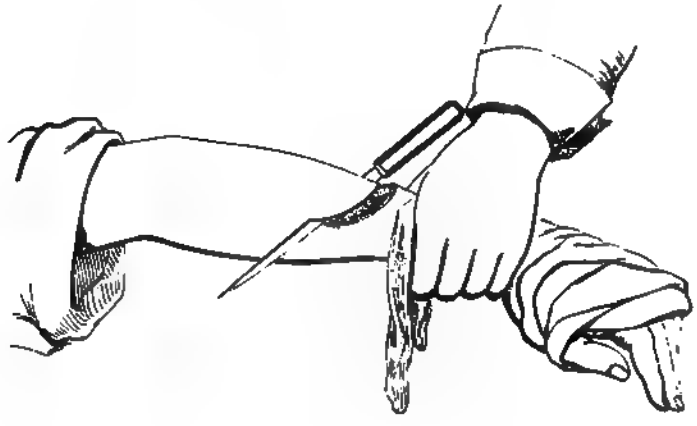
is not easy to obtain a sufficiency of fleshy covering. Yet when circumstances will at all permit—the general rule is not to be rashly deviated from; of removing as little as possible from the organs of prehension. And besides, another practical axiom comes into play; namely, that the farther removed an amputation is from the trunk of the body, the less is the risk to life thereby.

Fig. 306.

The ordinary tourniquet shown in application to the brachial artery; a bandage enacting the part of compress over the vessel—not very accurately placed.

The flaps may be made either by transfixion, or by cutting from without inwards. The former mode is usually preferred. In the case of the left forearm, the surgeon with his left hand pinches up the cushion of flesh on the dorsal aspect, and enters his knife horizontally over the ulna, bringing it out at a corresponding point over the radius. The knife is again introduced, beneath the ulna, and pushed through on the palmar aspect of the bones; not at the same point as the former transfixion, but about half an inch lower down—a precaution which is to be attended to in all double-flap amputations, as already stated (p. 687). An assistant retracts the flaps; with a few circular sweeps of the knife the surgeon clears the bone of soft parts, at the very upper

Fig. 307.



Amputation of the Forearm.

part of the wound; the interosseous space is freed, by the knife being passed between the bones; and the saw is then applied. At least, the

three principal vessels require ligature. The wound is then adjusted in the ordinary way.

In transfixion, it is obvious that care must be taken to avoid passing the knife between the bones. On this account, the position of the limb here recommended is preferable to the middle state between pronation and supination; and during the incisions, care must be taken that the position is maintained unaltered.

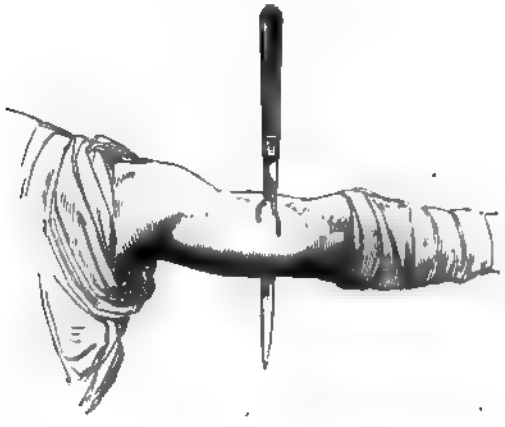
Amputation of the Elbow-Joint.

If space enough be left on the forearm, in extensive disease or injury of that part, the humerus need not be interfered with. An excellent operation may be done at the elbow; making a single flap in front. The limb is steadied, with the hand in a state of supination. Transfixion is made, by passing the knife over the condyles, in front of the joint; and, by cutting downwards and outwards, a large and suitable flap is constructed. With a circular sweep, the integuments behind are divided; and disarticulation is then effected. The olecranon may be sawn across; or, extending the forearm, this process may be wholly removed, the attachment of the triceps having been severed. The flap is then suitably adjusted over the trochlea of the humerus.

Amputation of the Arm.

Pressure is made on the upper part of the humeral, or in the axilla. The surgeon with his left hand steadies the limb, below the point of incision; an assistant, seated in front of the patient, supports the hand

Fig. 308.



Amputation of the Arm.

and forearm. The knife is entered, horizontally, over the bone near its centre, on the side of the limb nearest the surgeon; the point, having touched the bone, is passed lightly round to its anterior surface, by depression of the handle; then the handle is raised again to its former

level, and transfixion is completed. By cutting downwards and outwards, an anterior flap is formed. The knife is re-entered on the opposite aspect of the bone, a little lower down; and, after transfixion, is brought out so as to construct a corresponding flap posteriorly. The flaps having been retracted, the bone is bared, and the saw applied.

Amputation of the Shoulder-Joint.

Hemorrhage is restrained by pressure applied to the subclavian, above the clavicle; by the fingers alone, or by means of the handle of a key, well padded; or by means of any other suitable compressing agent. The pressure is not made downwards merely; but downwards and backwards, so as to jam the vessel between the compressing agent and the first rib. The patient may be either seated or recumbent. The former position is the more convenient for the operator, as well as for the compressor; but, if it be adopted, it is necessary to secure the patient against changing his position, through fainting or restlessness, by lashing him to the back of the chair by means of a sheet or towel, as well as by a suitable arrangement of supporting assistants. And now that chloroform is almost invariably employed, this posture is generally superseded by that of recumbency. In cases of injury, the selection of flaps, as to position and form, may not be left to the surgeon's choice; but may have been already indicated by the nature of the accident. When space and opportunity for selection are afforded, however, the operation may be accomplished in a variety of ways.

The method by transfixion, and by the formation of an outer and inner flap, is so generally preferred and practised, that to it alone need

Fig. 309.

Amputation of the Shoulder.

attention be directed. The steps of the operation vary according to the limb operated on. In the *right* shoulder it is effected thus: A long knife is entered on the top of the shoulder, about an inch below the acromion; and, passing round the joint, on its exterior, is brought out immediately within the posterior border of the axilla. By cutting out-

wards and downwards, a large outer flap is formed. The arm is then carried across the chest; and the head of the bone, thus made prominent, is cut down upon by a sweep of the knife. The capsule is opened, and disarticulation effected; and the blade of the knife, laid on the inside of the head of the bone, is carried rapidly inwards and downwards, so as to form an internal flap, considerably smaller than the other. The main artery is immediately secured by ligature; and then pressure on the subclavian is removed, lest, by its continuance, venous hemorrhage should be favored.

On the *left* side, the knife, having been entered within the margin of the posterior border of the axilla, is made to emerge on the top of the shoulder, a little beneath the acromion; and the outer flap is formed as before. The arm is then carried over the chest, disarticulation is effected, and an inner flap is formed. Or the outer flap may be marked out by a bistoury, and dissected up.

After cicatrization, the stump requires artificial protection; otherwise, the prominent acromion is apt to sustain injury.

Amputation of the Scapula.

Disease and injury sometimes, though rarely, render it necessary to take away the scapula along with the superior extremity. No fixed plan can be laid down for the incisions; they must vary according to the circumstances of the case. When such extensive mutilation is required on account of injury, the greater part of the incisions will probably be found already made.

Amputations of the Lower Extremity.

Amputation of the Toes.

The *Phalanges* of the toes are removed in the same way as those of the fingers. The metatarsal articulation, however, lies considerably deeper than the corresponding joint of the superior extremity; and the incisions require to be made accordingly. There is no necessity for removing the head of the metatarsal bone; the more ample the base of support, the more efficient is its function.

The Metatarsal Bone of the Great Toe is not unfrequently diseased in the greater part of its extent. It may be disarticulated; but it is better to divide it a little below its base, if possible, in order to leave the tendinous insertion there undisturbed. By a bistoury, such a flap is indicated as will efficiently cover the wound. The instrument is entered over the tarsal articulation, on the dorsum of the bone, and is carried down, along the dorsum, until the metatarsal joint is reached; a sweep is then made on the inner side of this, or rather a little below the joint; and the incision is continued upwards, leaving an interspace of about an inch and a half between the returning line of wound and that which descended. The flap, thus indicated, is dissected up; the bone, along with the corresponding toe, is isolated from its connections,

by a suitable use of the knife's point; and is either disarticulated, or cut across by the pliers, according to circumstances. After removal of the diseased part, and arrest of hemorrhage, the flap is brought down and adjusted to the raw surface.

The other Metatarsal Bones are liable to the same operations as the analogous bones of the superior extremity. A very useful foot may be left, after removal of even three of the toes with their metatarsal bones.

In estimating the extent of incisions required, it is important to remember the oblique direction of the metatarsal range.

Amputations of the Foot.

All the Toes may require removal at their metatarsal articulations, on account of frost-bite. A transverse incision is made on the dorsal aspect; sloping inwards, so as to make a short anterior flap. Disarticulation is then effected, at each joint; and, the blade of the knife having been laid behind the heads of the phalanges, a suitable flap is made from the plantar aspect.

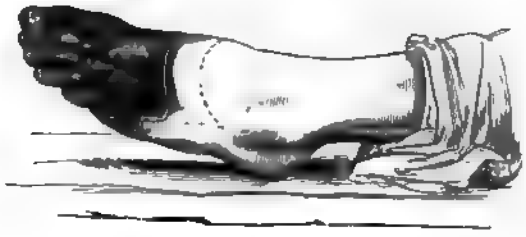
In the case of more extensive disease or injury, similar flaps may be formed—the plantar being made by transfixion; and then the metatarsal bones are divided by the bone-pliers.

Hey's Amputation.—The whole metatarsal range may be taken away, leaving the foot very useful. Hemorrhage is restrained by the pressure of an assistant at the ankle—mainly exerted on the posterior tibial. The patient is laid recumbent on a table, with the foot projecting over the edge. The surgeon, with his left hand, steadies and commands the toes. On the right foot, the prominence of the base of the metatarsal bone of the little toe is felt for; the knife's edge, laid on immediately above this, is carried across the dorsum of the foot in a semilunar direction, terminating at the articulation of the base of the metatarsal bone of the great toe with the internal cuneiform bone. The short anterior flap, thus indicated, is dissected up, and disarticulation is effected at each joint; the surgeon pressing heavily downwards on the toes and metatarsal range, so as to favor this, by rendering the joints more open. The peculiarity of the relative position of the base of the second metatarsal bone has to be borne in mind; and the point of the knife, only, should be used for its detachment. Should anchylosis have taken place there, the pliers or saw are to be employed; dividing the bone on a line with the general range of articulation. Disarticulation having been effected, the blade of the knife is laid on behind, and a sufficient flap is made from the sole of the foot—longer on the inner than on the outer aspect. Or the flap may be fashioned, and dissected up, probably more accurately by cutting from without inwards. The bleeding vessels having been secured, the flaps are adjusted by suture and strap.

In operating on the left foot, the dorsal incision is begun over the articulation of the metatarsal bone of the great toe with the internal cuneiform bone, and terminates behind the prominent head of the metatarsal bone of the little toe; in other respects the operation is the same.

Chopart's Operation.—Amputation may be performed still higher, leaving a useful stump. Disarticulation is effected between the astragalus and the navicular bone; all the bones of the foot and tarsus being removed, except the astragalus and calcaneum. The operation is conducted on the same principles as the preceding; a short flap being made in front; and the main flap being obtained from the sole of the foot. The marks for laying on the knife in its dorsal sweep are, the articulation of the navicular bone with the astragalus—behind the prominence of the navicular bone, in front of the inner ankle; and the articulation

Fig. 810.



Amputation of the Foot. (Chopart's.)

of the cuboid with the os calcis—about midway between the outer ankle and the prominent base of the metatarsal bone of the little toe. Often, however, these marks cannot be discerned, on account of swelling.

After cicatrization, the remnant of the foot is not displaced backwards, so as to bring the cicatrix in contact with the ground in walking, as might have been expected, from preponderating action of the muscles of the calf. The muscles on the front of the leg, forming new attachments, seem to counteract this effectually.

A third amputation of the foot—intermediate between the two preceding—may be performed, by disarticulating the cuneiform bones from the navicular, and sawing the cuboid bone across at a corresponding point. The general plan of the incisions is the same as in the two preceding cases.

Resection of the Ankle.

When disease is limited to the ankle-joint and upper part of the tarsus, it is a question whether or not excision of the diseased parts may not be performed, leaving the foot. On this principle, Mr. Wakley has removed the calcaneum and astragalus, at the same time sawing off the malleolar surfaces of the tibia and fibula.[1] Farther experience of this operation, however, will probably be required, ere it be received as a substitute for that next described.

[1] Lancet, No. 1296, p. 5.

Amputation of the Ankle.

When no part of the foot and tarsus can be saved, amputation is required either in the leg or at the ankle. The latter site is preferable on more than one account; risk to life is less, the mutilation is less, and the stump is not only more useful in progression, but also less liable to neuralgia and exfoliation. Disease of the ankle-joint does not contraindicate the operation, unless it extend beyond the ends of the bones. And, in most cases of diseased ankle, indeed, it were now unwarrantable to perform any other operation.

For the revival and more general introduction of this procedure, the profession is indebted to Mr. Syme.

The patient having been suitably arranged on a table, a tourniquet is applied, so as to compress the popliteal artery, or the fingers of an assistant may be employed, as in amputation of the foot (p. 696). A

Fig. 811.

Amputation of the Ankle.

semilunar incision, directed forwards, is made over the instep, with a strong bistoury or short amputating knife, and a corresponding wound is made across the sole of the foot. "The foot being placed at a right angle to the leg, a line drawn from the centre of one malleolus to that of the other, directly across the sole of the foot, will show the proper extent of the posterior flap. The knife should be entered close up to the fibular malleolus, and carried to a point on the same level of the opposite side, which will be a little below the tibial malleolus. The anterior incision should join the two points just mentioned at an angle of 45°, to the sole of the foot, and long axis of the leg. In dissecting the posterior flap, the operator should place the fingers of his left hand upon the heel, while the thumb rests upon the edge of the integuments, and then cut between the nail of the thumb and tuberosity of the os calcis, so as to avoid lacerating the soft parts which he, at the same time, gently but steadily presses back until he exposes and divides the tendo Achillis. The foot should be disarticulated before the malleolar

projections are removed, which it is always proper to do, and which may be most easily effected by passing a knife round the exposed extremities of the bones, and then sawing off a thin slice of the tibia connecting the two processes."[1] In most cases, the operation will be most readily conducted by completely opening the joint from the front, before dissecting off the soft parts from the calcaneum. Bleeding having been arrested, the flaps are brought together by suture, and care must be taken, during the cure, to prevent accumulation of pus in the pouch which may be formed by the posterior flap. After cicatrization, a most efficient, round, callous stump is produced, the patient resting on the integuments of the heel, well accustomed to pressure, and retaining a full use of the knee and leg.

It has been said that division of the posterior tibial artery, before it divides into its plantar branches, should be avoided; otherwise, partial sloughing of the flaps is apt to ensue. Usually, however, incision will not be found to interfere with the arterial trunk in question. And it is probable that in those cases in which sloughing has occurred, the accident was not wholly attributable to deficiency of arterial supply.

Should circumstances not be suitable to the plan of incision as above described, lateral flaps may be made, leaving the integument of the heel as much entire as possible. The operation may be readily effected in this way, but there is risk of a less convenient cicatrix resulting, and consequently of the stump proving less useful in progression.

Amputation of the Leg.

This is not altogether superseded by the operation at the ankle. There are still not a few cases occurring, in which the latter procedure would prove quite insufficient. And in regard to some of these it is to be feared that the natural preference for a new operation may lead to its performance in circumstances quite unsuitable. The affected parts of the leg-bones having not been sufficiently removed, sinuses and fistulæ may form, communicating with caries, long retarding complete cure, rendering the stump but little serviceable, perhaps, even when healed, and, probably, at length, demanding a second amputation.

Near the ankle, a fleshy stump is not to be obtained in thin persons; and in these, consequently, we may be compelled to cut somewhat higher than otherwise might have been necessary. On the other hand, there are stout limbs, their rotundity mainly caused by a solid œdema, in which it is desirable to amputate low down, in order to avoid redundancy of soft parts.

Hemorrhage is restrained by pressure on the popliteal, either by a tourniquet, or by the fingers of an assistant, or by the assistant's pressure on the femoral artery, as it passes over the brim of the pelvis. The patient is laid on a firm table, of convenient height, with the limbs projecting over its edge; the sound ankle is secured to the leg of the table by means of a towel, the work of an additional assistant being thus spared, and the doomed limb is supported by an assistant seated

[1] Syme, Contributions to Surgery, p. 146, and Monthly Journal, Feb. 1850, p. 173.

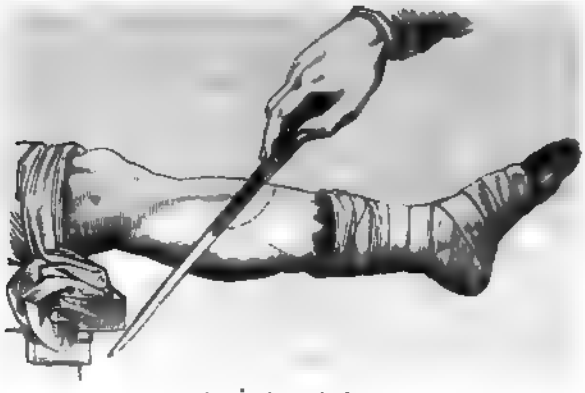
in front. The surgeon, feeling the exact outline of the bones, transfixes, passing his knife as closely as possible to their posterior surfaces;

Fig. 312.

Mason's Flat Tourniquet, applied to the Popliteal.

and, by carrying it downwards and outwards, a long posterior flap is formed. The knife is then laid on at the upper margin of the wound;

Fig. 313.



Amputation of the Leg.

by a sweep in front, in a semilunar direction, the integument is divided; this having been retracted, the interosseous space is cleared by the knife passed between the bones, and the saw is then applied as close to the soft parts as possible. If the ridge of the tibia project, much and sharply, it may be rounded off by means of the bone-pliers. Bleeding having been arrested, the flap is brought up and secured.

To facilitate transfixion, and guard against locking of the knife between the bones, it may be well to make a little alteration in the procedure. Supposing that the right leg is operated on, the knife is entered on the outside of the fibula, about an inch, or more, beneath the point where transfixion is contemplated; with a sawing motion the instrument is carried upwards along the outside of the bone, until the site of transfixion is reached; the blade is then applied in front, to form the anterior wound; and, the point having arrived at the inside of the

Fig. 814.

The forceps shown at work. The artery fairly isolated, and made to project. Seldom it protrudes so far: but when it does, the ligature is applied close to the base, and scissors or knife amputates the redundant part.

tibia, transfixion is effected—the instrument emerging at the upper part of the wound formerly made on the outside of the fibula.

In operating immediately below the knee, the fibula is sawn across, along with the tibia. Disarticulation of the head of the former bone may improve the appearance of the stump, at the time of its formation; but experience has shown that the procedure is not warrantable, on account of the risk of subsequent inflammatory seizure in the knee-joint.

A short stump having been made, the patient usually rests on the knee, with the stump bent at right angles; and to the knee the artificial limb is adapted. When the stump is long, however, the motions of the knee-joint are retained, and the false limb is adapted to the leg immediately above the cicatrix.

When stout muscular men sustain such injury of the leg as requires amputation below the knee, a redundancy of flesh cannot fail to be obtained in the flap, by the ordinary mode of operation. And, accordingly, Mr. Liston has advised, in such cases, a modification of the circular amputation. "Supposing the left leg to be injured: with a common amputating knife an anterior semilunar incision is made through the skin, commencing from the inner side of the tibia, about four fingers' breadth below its superior extremity, and passing over its anterior aspect. A similar semilunar incision is made at the posterior part of the leg, its extremities joining the horns of the previous incision. The integument is then reflected upwards to a sufficient extent to cover the bones, and the operation is finished after the manner of the circular amputation."

Amputation of the Knee-Joint.

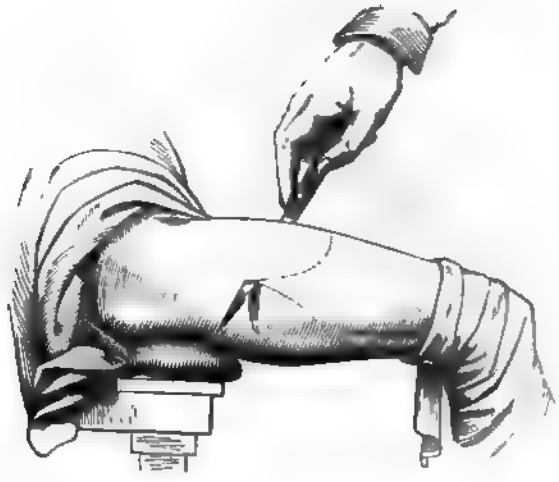
Latterly, this operation has also been revived; when injury or disease extend no higher than the condyles of the femur, and involve these only to a superficial extent. A semilunar incision is made on the front of the limb, passing beneath the patella; the integuments are

dissected up, and transfixion is made behind; by cutting downwards, a very long flap is made from the back part of the leg; and, the soft parts having been all detached, section of the bone is made through the condyles. Bleeding having been arrested, the flaps are approximated. The operation is easily enough accomplished, but experience seems to have unequivocally decided on this revival unfavorably.

Amputation of the Thigh.

The patient is arranged as for amputation below the knee, but with the pelvis resting on the edge of the table. The femoral is compressed

Fig. 315.



Amputation of the Thigh.

by an assistant, as it passes over the horizontal ramus of the pubes. The operation is by double flaps.

Low down in the thigh, a suitable amount and character of soft parts can be obtained only from the lateral aspects of the limb. Transfixion accordingly, is made perpendicularly.

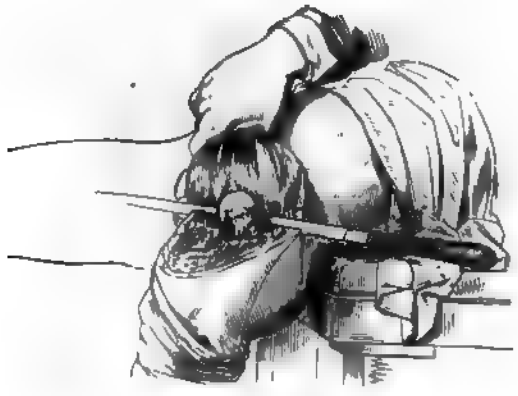
On the upper part of the thigh, the flaps are anterior and posterior (p. 687); transfixion is horizontal; and the operation is performed in the same way as the analogous procedure in the arm. The posterior flap should be considerably longer than that in front; to compensate for the greater displacement upwards, by contraction, to which the muscles on the posterior part of the thigh are liable—and for the greater amount of permanent atrophy by absorption, which the posterior flap invariably undergoes. Immediately after section by the saw, the muscles inserted into the trochanter-minor project the end of the bone forwards; and, in consequence of this, protrusion at the upper angle of the wound would be apt to take place, were the flaps made laterally; while, as it is, the more the bone is bent forwards, the more completely is its extremity covered by the anterior flap.

Amputation of the Hip-Joint.

Amputation at the hip-joint is seldom required. The operation is one of great severity, and eminently perilous to life; yet, when circumstances are urgent and decided, we need not shrink from its performance. There are already nearly thirty successful cases in the records of surgery.[1] For malignant disease of the femur, the operation is unadvisable; experience having shown that, even although the operation itself may be temporarily successful, return of disease in the interior will surely carry off the patient—probably at an earlier period, and more painfully, than if the tumor had been left undisturbed in its original site.

The patient is placed on the table, with his pelvis projecting from the edge. A steady assistant compresses the femoral; and is ready to follow the knife with his fingers, during formation of the anterior flap, so that he may grasp the end of the vessel almost as soon as it is divided. The knife is entered about midway between the trochanter-major and the anterior superior spinous process of the ilium, and is made to emerge on the inside of the thigh, after having passed in a somewhat curved direction over the articulation; the assistant, who supports the limb, gently rotating the thigh inwards. By cutting downwards, a suitable anterior flap is formed. The assistant, then abducting the thigh, presses it backwards; and, by a determined sweep of the knife over the head of the bone thus made prominent, the joint is cut into. With the point

Fig. 316.



Amputation of the Hip-Joint.

of the instrument, the round ligament is divided, and disarticulation effected. The blade of the knife is then placed behind the bone, and carried downwards and backwards, so as to form the posterior flap; the assistant managing the limb so as to prevent locking of the instrument by the trochanter-major. Or the posterior flap may be formed by cut-

[1] Brit. and For. Rev. No. 43, p. 112.

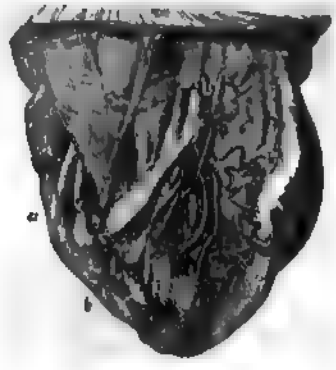
ting from without inwards. However made, it is instantly covered by a sponge; and the vessels there are rapidly secured. Afterwards, the assistant is relieved from his charge of the femoral.

By some, the formation of lateral flaps is preferred. Not unfrequently, in cases of injury, there may be no room for selection; the extent of the accidental wound precluding all attempts at regular operation, and compelling the surgeon to shape his flaps according to what may be, perhaps, quite an original mode of procedure.

Affections of Stumps.

Neuralgia of the stump is no unfrequent result of amputation, however skilfully conducted (*Principles*, 3d Am. Ed. pp. 398 and 585). It is most commonly observed after amputation below the knee. If no change of structure in the nerve can be detected, the treatment must be such as is suitable for neuralgia in general; and, of the remedies usually found most useful, iron internally, and the light application of nitrate of silver to the part, may be specially mentioned. If neuromata plainly exist, entangled with the dense cicatrix, they ought to be removed; and, for this purpose, a repetition of the amputation on a minor scale is usually necessary; care being taken in the fashioning of the

Fig. 317.



Neuromata of Stump, after amputation of the arm. A large neuromatous mass at *a*; opposite *b*, the tumors are more defined.

stump, and in the after-treatment of it, that the nerves be not again similarly circumstanced. Not unfrequently, however, notwithstanding every care, neuralgia returns—obviously dependent on a general more than on a local cause (*Principles*, 3d Am. Ed. p. 590). The neuralgic part should not be pressed upon in the adaptation of any artificial limb.

Exfoliation from the stump seldom follows a well-conducted flap-operation. It is most likely to occur when section has been made in the dense part of a bone, as in the middle of the femur. The sequestrum may consist of a mere scale from the sawn surface; or it may be of some length—involving the whole thickness of the bone at its lower

part, and tapering, upwards, of a cancellous texture. Healing of the wound is necessarily delayed until detachment and extrusion of the sequestrum have taken place.

Sometimes, in an ill-formed stump, or when the soft parts have perished by sloughing, the end of the bone projects, uncovered, partially necrosed, and in part, perhaps, carious. In such a case, renewal of the amputation is necessary; or the making of such incisions as may admit of the bone being sawn, at a point sufficiently high for subsequent fleshy covering.

The accidents of exfoliation, and protrusion of the end of the bone, ought to be prevented, by fashioning the flap or flaps so as to afford a full covering for the end of the bone—allowance being always made for subsequent contraction and atrophy, by sawing the bone, carefully, close to its connection with the soft parts—not leaving any portion bare and projecting, stripped of both flesh and periosteum, at the time of the operation; by so conducting the cure as to prevent untoward accessions of inflammatory action, whereby ulceration, sloughing, or

Fig. 318.

Fig. 318.—Necrosis of the Femur, after amputation. At *a*, the sequestrum in process of separation. At *b*, the parent bone enlarged, and undergoing inflammatory change, necessary for detachment and repair.

Fig. 319.

Fig. 319.—The sequestrum detached; at its lower part, *a*, including the whole thickness of the bone, but gradually shelving upwards, as such sequestra usually do.

long gaping of the wound might occur; by opposing excessive retraction of the muscles, if need be, by bandaging—in those cases in which the process of granulation is interrupted or tedious. The face of a well-formed stump is "fenced with firm skin, and no more liable to accident than a man's finger-ends."

A *Bursa* usually forms over the end of the bone; tending towards

tolerance of pressure. A blow, or other injury, may induce painful enlargement of this; and the fluctuation, and other characters of the swelling, may simulate the condition of acute abscess very closely. Accuracy of diagnosis is obviously of importance; as, in the one case, early incision is advisable; while, in the other, rest and fomentation, with perhaps leeching, prove sufficient.

Hemorrhage.—Bleeding, taking place within a few hours after the operation—when the patient grows warm in bed, and recovers fully from the state of shock—usually requires an undoing of the partial approximation of the wound, and the application of ligatures to the open vessels. But if at the time of operation, due care have been taken to apply deligation accurately to each likely orifice, the occurrence of such a casualty need seldom be apprehended.

Hemorrhage which occurs at a more remote period, in consequence of ulceration having attacked the stump, may, if slight, be restrained by pressure. But, in general, deligation of the arterial trunk is necessary; for example, deligation of the femoral, after amputation below the knee; deligation of the humeral, after amputation of the forearm (*Principles*, 3d Am. Ed. p. 353).

Roux, Relation d'un Voyage fait à Londres, Paris, 1814. Hammick on Amputations, Fractures, &c., Lond. 1830. Alcock, Lectures on Amputation, Lancet, 1840–41. Cox, Memoir on Amputation at the Hip-Joint, Lond. 1845. Maingault's Operative Surgery, by Cox, Lond. 1845. Liston's Practical Surgery, Lond. 1846. Malgaigne, Operative Surgery, by Brittan, Lond. [redacted] Bourgery, Operative Surgery, Paris, 1846. Skey, Operative Surgery, Lond. 1[redacted] Fergusson, Practical Surgery, Lond. 1852. Larrey, Mémoire sur les Amputations, Mém. de Chir. Milit. vol. ii.

INDEX.

Abdomen, affections of, 367
Abdomen, bruise of, 368
Abdomen, wounds of, 369
Abdominal aorta, aneurism of, 625
Abdominal parietes, abscess of, 367
Abdominal tumors, 368
Abscess of the abdominal parietes, 367
Abscess of the antrum, 180
Abscess of the brain, 51
Abscess of the cornea, 123
Abscess of the dura mater, 51
Abscess of the ear, 237
Abscess of the ham, 643
Abscess, lumbar, 343
Abscess of the mastoid cells, 238
Abscess of the neck, 245
Abscess of the pharynx, 225
Abscess, psoas, 343
Abscess exterior to the rectum, 412
Abscess of the septum narium, 171
Abscess of the tonsil, 221
Abscess of the vulva, 592
Abscess, pelvic, 373
Abscess of prostate, 509
Abscess and ulcer of cranium, 82
Abscess, urinous, 562
Acetabulum, fracture of, 646
Achillis, tendo, injuries of, 673
Acids, swallowing of, 263
Accidents of venesection, 296
Accidental swallowing of irritant fluids, 263
Acromion, fracture of, 312
Albugo, 126
Amaurosis, 141
Amputation, 682
Amputation of the ankle, 698
Amputation of the arm, 693
Amputation, circular, 686
Amputation of the elbow-joint, 693
Amputation of the forearm, 691
Amputation of the fingers, 687
Amputation of the foot, 696
Amputation of the hip-joint, 703
Amputation of the knee-joint, 701
Amputation of the leg, 700
Amputations of the lower extremity, 695
Amputation of the metacarpal bones, 688
Amputation of the metacarpal bone of little finger, 690
Amputation of the metatarsal bone of great toe, 695
Amputation of the metatarsal bones, 696
Amputation of the penis, 590
Amputation of the shoulder-joint, 694
Amputation of the scapula, 695
Amputation of the thumb, 690
Amputation of the toes, 695
Amputation of the thigh, 702
Amputation of the wrist, 691
Amussat's operation for artificial anus, 432
Ammoniaco-magnesian phosphate calculus, 448
Anal fist[redacted]3
Anal pr[redacted], 423
Anchylo[redacted]epharon, 95
Aneurism, false, of temporal artery, 31
Aneurism, popliteal, 631
Aneurism of abdominal aorta, 625
Aneurism of common femoral, 628
Ankle, amputation of, 698
Ankle, compound dislocation of, 670
Ankle, dislocation of, 669
Ankle, fracture of, 660
Ankle, resection of, 697
Anonyma, arteria, ligature of, 288
Anus, artificial, 371
Anus, fissure of, 417
Anus, imperforate, 430
Anus, itching of, 428
Anus, ulcer of, 417
Anus, formation of artificial, 431
Anus, prolapsus of, 423
Antrum, abscess of, 180
Antrum, collection of fluid in, 180
Antrum, polypus of the, 180
Anchylosis of the ja[redacted], 212
Aorta, abdominal, aneurism of, 625
Aorta, compression of, 625
Aorta, deligation of, 625
Aquo-capsulitis, 123
Arcus-senilis, 127
Arm, amputation of, 693
Arm, bend of the, affections of, 295
Arteria, anonyma, deligation of, 288
Arteries of the neck and superior extremity, affections of the, 287
Arteries of the forearm, deligation of, 293
Arteriotomy, 30

Artery, superficial femoral, deligation of, 681
Artery, subclavian, deligation of, 288
Artery, temporal, false aneurism of, 31
Artery, temporal, wounds of, 30
Artery, ulnar, deligation of, 293
Artificial anus, 371
Artificial pupil, 137
Artificial pupil, operations for, 138
Artificial anus, formation of, 431
Arteriotomy, ulceration after, 30
Astragalus, dislocation of, 671
Astragalus, fracture of, 660
Asphyxia, 262
Atrophy of the testicle, 571
Auricle, affections of, 243
Auricle, hypertrophy of the, 24[illegible]
Axillary artery, deligation o[illegible]
Auxiliaries to the taxis, 396

Balanitis, 521
Beer's knife, 149
Bend of the arm, affections of, 295
Biceps, displacement of tendon of, 327
Bladder, affections of, 488
Bladder, displacement of, 507
Bladder, hæmaturia from the, 491
Bladder, inflamed, 488
Bladder, injuries of, 504
Bladder, irritable, 490
Bladder, puncture of, 500
Bladder, puncture of, by perineum, 500
Bladder, puncture of, by rectum, 501
Bladder, puncture of, above pubes, 501
Bladder, stone in the, 454
Bladder, treatment of stone in the, 458
Bladder, tumors of, 505
Blepharitis, 92
Blepharoplastics, 104
Blood, extravasation of, affecting the brain, 47
Boiling water, swallowing of, 253
Bougie, caustic, 560
[illegible]

Bruise of the abdomen, 368
Bruise of the larynx, 262
Bruise of the scalp, 22
Bubo, 536
Bubo, inguinal, 536
Bubo, venereal, 536
Bunions, 679
Bursa over olecranon, affec
Bursa over patella, affectio
Bursa, thyro-hyoid, enlarge
Bursæ over stumps, 705

Calcaneum, fracture of, 66(
Calculi, prostatic, 485
Calculi, urethral, 483
Calculous disease, 436
Calculous disease, treatmen
Calculi, urinary, formation 446
Calculi, urinary, 436
Calculi, renal, 452
Calculus, alternating, 450
Calculus, ammoniaco-magne [illegible]
Calculus, carbonate of lime,
Calculus, cystic oxide, 449
Calculus, oxalate of lime, 4
Calculus, fibrinous, 450
Calculus, fusible, 449
Calculus in the female, 485
Calculus, lithate of soda, 45
Calculus, mulberry, 448
Calculus, palliation of vesicl
Calculus, phosphate of lime,
Calculus, preputial, 485
Calculus, urate of ammonia,
Calculus, uric, 447
Calculus, uric or xanthic ox
Calculus, vesical, 454
Calvarium, tumors of the, 8
Cancer, chimney-sweeper's,
Cancer of the eyelids, 95
[illegible]

Carbonate of lime calculus, 449
Carpus, dislocation of, 330
Carpus, fracture of, 323
Caries of the skull, 82
Caruncula lacrymalis, affections of, 110
Castration, 579
Cataract, 143
Cataract, breaking up of, 151
Cataract, capsular, 146
Cataract, capsulo-lenticular, 146
Cataract, couching of, 150
Cataract, distinguished from glaucoma and amaurosis, 144
Cataract, depression of, 150
Cataract, dissolution of, 151
Cataract, drilling for, 151
Cataract, extraction of, 147
Cataract, false, 144
Cataract, hard, 144
Cataract, lenticular, 144
Cataract, Morgagnian, 145
Cataract, operations on, 146
Cataract, radiated, 145
Cataract, symptoms of, 143
Cataract, spurious, 144
Cataract, soft, 145
Catarrhus vesicæ, 488
Catheter, female, passing of, 605
Catoptrical test, 144
Caustic bougie, 560
Cerebri, hernia, 71
Cerumen in the ear, 240
Cervix uteri, extirpation of, 620
Cervix uteri, inflammatory affections of, 607
Cervix uteri, stricture of, 617
Cervix uteri, ulceration of, 608
Ceruminous secretion, deficiency of, in the ear, 240
Cervical vertebræ, disease of, 285
Chancre, Hunterian, or true, 528
Cheiloplastics, 195
Cheek, sinus of the, 188
Cheek, tumors of the, 187
Chemosis, 115
Chest, affections of, 346
Chest, wounds of, 348
Child, syphilis in, 547
Chimney-sweeper's cancer, 584
Chopart's amputation of the foot, 697
Choroid coat, affections of, 131
Choroiditis, 131
Circular amputation, 686
Cirsocele, 577
Cirsocele, diagnosis of, 578
Clavicle, dislocation of, 324
Clavicle, fracture of, 309
Clitoris, hypertrophy of, 594
Cloaca, 431
Club-hand, 301
Club-foot, 675
Coat, choroid, affections of, 131
Coat, sclerotic, affections of, 130
Coccyx, fracture of, 645
Columna nasi, formation of, 175
Compression of the brain by depressed bone, 66
Compression of the brain by abscess, 51; treatment of, 54
Compression of the brain by extravasation, 47
Compression of the brain, 43
Compression of the spinal cord, 334
Compressor, Signoroni's, 683
Compression of aorta, 625
Compound fractures of thigh, 655
Concussion of the brain, 32
Concussion and compression combined, 46
Concussion of the spinal cord, 333
Concussion of the brain, treatment of, 38
Concussion of the brain, consequences of, 41
Concussion and compression, distinction between, 46
Concretions, salivary, 219
Condyloma, 534
Congenital hydrocele, 574
Congenital hernia, 405
Congenital occlusion of the meatus auditorius, 243
Conjunctiva, granular, 115, 119
Conjunctivitis, purulent, 115
Conjunctivitis, simple, 112
Conjunctivitis, strumous, 119
Conjunctiva, affections of the, 112
Contraction of toes, 681
Contre-coup, 48
Coracoid process, fracture of, 312
Coretomia, 138
Corectomia, 134
Coredialysis, 140
Cord, spermatic, hæmatocele of, 576
Cord, spermatic, hydrocele of, 575
Cord, spermatic, tumors of, 579
Cord, spermatic, varix of, 577
Cornea, affections of the, 121
Cornea, abscess of, 123
Cornea, conical, 129
Cornea, hernia of, 125
Cornea, opacities of, 126
Cornea, over-distension of, 129
Cornea, staphyloma of, 127
Cornea, ulcer of, 124
Corneitis, 121
Corneitis, strumous, 123
Corns, 679
Coronoid process of ulna, fracture of, 318
Corroding ulcer of uterus, 621
Couching, 150
Coup, 48
Coxalgia, 635
Cramp, writers', 301
Cranium, abscess and ulcer of the, 82
Cranium, affections of, 82
Cranium, depression of, 66
Cranium, exostosis of the, 84
Cranium, fissure of, 56
Cranium, fractures of, 56
Cranium, fractures of, at base, 57
Cranium, fissure at base of, 57

Cranium, fracture of, without displacement, 60
Cranium, fracture of, with displacement, 60
Cranium, fracture of external table of, alone, 65
Cranium, fracture of inner table of, alone, 66
Cranium, injuries of, 32
Cranium, ordinary fractures of, 56
Cranium, penetrating cuts of, 65
Cranium, punctured fractures of, 63
Croup, 267
Cut-throat, 254
Curvatures of spine, 337
Curvature, lateral, of spine, causes of, 337
Cynanche tonsillaris, 221
Cystitis, 488
Cystitis, acute, 488
Cystitis, chronic, 488
Cystocele, vaginal, 604
Crystalline lens and capsule, affections of, 143
Cysticercus telæ cellulosæ, 156
Cystic oxide calculus, 449
Cuneiform bones, dislocation of, 672
Cynanche membranacea, 269
Cystine deposit, 445

Dacryolithes, 110
Dacryadenitis, 110
Deafness, 239
Deformities of hand, 303
Deformities of foot, 673
Deligation of carotid artery, 287
Deligation of anonyma, 288
Deligation of subclavian, 288
Deligation of axillary, 291
Deligation of humeral, 292
Deligation of radial and ulnar, 293
Deligation of aorta, 625
Deligation of external iliac, 626
Deligation of internal iliac, 627
Deligation of common iliac, 628
Deligation of common femoral, 631
Deligation of superficial femoral, 631
Deligation of popliteal, 631
Deligation of posterior tibial, 632
Deligation of anterior tibial, 633
Deligation of peroneal, 634
Delirium after injuries of the head, 41
Deposit, lithic, 438
Deposit, oxalate of lime, 441
Deposit, phosphatic, 443
Deposit, cystine, 445
Deposit, uric, 446
Deposit, xanthic oxide, 446
Depressed fracture of the cranium, 66
Depression of cataract, 150
Diaphragm, affections of the, 385
Diaphragm, paralysis of the, 385
Diaphragm, rupture of the, 385
Diaphragmatic hernia, 409
Diastasis of the femur, 655
Diatheses, 436
Diathesis, lithic, 438
Diathesis, oxalic, 441
Diathesis, phosphatic, 443
Diphtheritis, 269
Diplopia, 142
Diseases of scalp and cranium, 78
Dislocations of superior extremity, 324
Dislocation of the carpus, 330
Dislocation of the lower jaw, 211
Dislocation of the clavicle, 324
Dislocation of the scapula, 324
Dislocation of the shoulder, 325
Dislocation of the elbow, 325
Dislocation of the ulna, 328
Dislocation of the radius, 329
Dislocation of the wrist, 330
Dislocation of the fingers, 331
Dislocation of the thumb, 331
Dislocation of the spine, 336
Dislocation of the ribs, 347
Dislocation of the pelvis, 681
Dislocation of the hip, 661
Dislocation of the knee, 668
Dislocation of the patella, 669
Dislocation of the ankle, 669
Dislocation of the tarsus, 671
Dislocation of the toes, 672
Dislocation of tibia at the knee, 668
Dislocation of tibia at the ankle, 669
Dislocation, compound, of the ankle, 670
Dislocation of the head of fibula, 669
Dislocation of the astragalus, 672
Dislocation of the os calcis and astragalus, 672
Dislocation of the cuneiform bones, 672
Dislocation of the metatarsus, 672
Dislocation of the crystalline lens, 152
Displacement of the bladder, 507
Displacements of the uterus, 616
Distichiasis, 97
Distoma oculi, 155
Diverticulum of intestine, 410
Dropsy of the eye, 154
Dropsy, ovarian, 374
Duct, nasal, obstruction of, 109
Duct, nasal, obliteration of, 110
Duct, nasal, absence of, 110
Dura mater, abscess of, 51

Ear, affections of, 235
Ear, polypus of, 235
Ear, hemorrhage from, 242
Earache, 239
Ecchymosis of eye, 91
Ectropion, 102
Eczema mercuriale, 546
Elbow, amputation of, 693
Elbow, dislocation of, 328
Elbow-joint, resection of, 307
Elephantiasis of scrotum, 583
Emphysema, 346
Empyema, 352
Encanthis, 111
Encysted hydrocele, 575
Encysted tumors of scalp, 79
Encysted tumors of eyelids, 94

Enlargement of prostate, 510
Entozoa in the eyeball, 155
Entropion, 98
Entropion, Crampton's operation for, 100
Enuresis, 493
Enuresis in children, 493
Epididymitis, 565
Epiphora, 105
Epispadias, 589
Episoraphy, 616
Epistaxis, 167
Epulis, 205
Erectile tumors of orbit, 90
Erectile tumors of scalp, 79
Erectile tumor of tongue, 215
Erectile tumor of nose, 167
Erethismus, 546
Erysipelas of face, 186
Erysipelas of scalp, 78
Erysipelas of scrotum, 583
Eustachian tube, affections of, 241
Exfoliation of skull, 83
Exfoliation from stumps, 704
Exomphalos, 409
Exostosis of cranium, 84
Exostosis of great toe, 68
Extirpation of cervix uteri, 620
Extraction of cataract, 147
Extraction of teeth, 202
Extravasation of blood within cranium, 46
Extravasation of blood between bone and dura mater, 27; treatment of, 48
Extravasation of blood on or in brain, 48; treatment of, 49
Extravasation of urine, 502
Extravasation, vesical, of urine, 502
Extravasation, urethral, of urine, 503
Extremity, superior, affections of arteries of, 287
Extremity, superior, diseases of articulations of, 304
Extremity, superior, injuries of, 309
Eye, dropsy of, 154
Eyeball, affections of, 112
Eyeball, congenital deficiency of, 157
Eyeball, entozoa in, 155
Eyeball, extirpation of, 156
Eyeball, tumors of, 156
Eyeball, wounds of, 155
Eyelid, hypertrophy of, 95
Eyelids, injuries of, 91
Eyelids, cancer of, 95
Eyelids, closure of, 95
Eyelids, foreign bodies in, 91
Eyelids, swellings of, 93
Eyelids, tumors of, 94
Eyelids, warts on, 94
Eyelids, wounds of, 91

Face, affections of, 186
Face, erysipelas of, 186
Face, neuralgia of, 187
Face, spasm of, 186
Face, warts of, 184
Face, wounds of, 186
False aneurism, 31
False passages in urethra, 555
False cataract, 144
Fascia, palmar, contraction of, 301
Female, calculus in the, 485
Female, gonorrhœa in the, 522
Female, retention of urine in the, 500
Female, syphilis in the, 547
Femoral artery, compression of, 628
Femoral artery, deligation of, 628
Femoral artery, common, aneurism of, 628
Femoral hernia, 406
Femur, fractures of, 646
Femur, fracture of neck of, within capsule, 646
Femur, fracture of, external to capsule, and above trochanter, 648
Femur, fracture of, through trochanters, 654
Femur, fracture of trochanter-major of, 654
Femur, fracture of, below trochanter-minor, 654
Femur, fracture of shaft of, 655
Femur, fracture of, above condyles, 655
Femur, fracture of condyles of, 655
Fibula, dislocation of head of, 661
Fibula, fracture of, 657
Filaria oculi humani, 155
Fingers, amputation of, 687
Fingers, dislocation of, 331
Fingers, hypertrophy of, 303
Fingers, supernumerary, 303
Fingers, webbed, 303
Fissure at the base of cranium, 57
Fissure of the anus, 417
Fissure of the cranium, 56
Fissure, spinal, 336
Fistula after lithotomy, 479
Fistula, fecal, 372
Fistula in ano, 413
Fistula in perineo, 563
Fistula lachrymalis, 107
Fistula, recto-vaginal, 601
Fistula, salivary, 188
Fistula, spermatic, 569
Fistula, tracheal, 272
Fistula, urinary, 563
Fistula, urethro-vaginal, 601
Fistula, vaginal, 595
Fistula, vesico-vaginal, 595
Flap-amputation, 683
Flat-foot, 678
Foot, affections of, 675
Foot, amputation of, 696
Forearm, amputation of, 691
Forearm, deligation of arteries of, 293
Foreign bodies in the brain, 70
Foreign bodies in the ear, 235
Foreign bodies in the eye, 91
Foreign bodies in the nostrils, 170
Foreign bodies in the œsophagus, 231
Foreign bodies in the pharynx, 227
Foreign bodies in the rectum, 429
Foreign bodies in the vagina, 604
Foreign bodies in the windpipe, 258
Fracture of acromion, 312

Fracture of astragalus, 660
Fracture of fibula, 657
Fracture of body of scapula, 312
Fracture of both tibia and fibula, 658
Fracture of both radius and ulna, 322
Fracture of calcaneum, 660
Fracture of cranium, without displacement, 60
Fracture of cranium, with displacement, 60
Fracture of external table of cranium alone, 65
Fracture of inner table of cranium alone, 66
Fracture, depressed, of cranium, 66
Fracture of carpal bones, 323
Fracture of clavicle, 309
Fracture of coracoid process, 312
Fracture of cranium, 56
Fracture of femur, 646
Fracture of humerus at its condyles, 316
Fracture of humerus at its neck, 314
Fracture of humerus at its shaft, 315
Fracture of leg, 657
Fracture of lower jaw, 210
Fracture of malar bone, 189
Fracture of malleoli, 660
Fracture of metacarpal bones, 323
Fracture of nasal bones, 162
Fracture of patella, 656
Fracture of pelvis, 645
Fracture of phalanges of fingers, 323
Fracture, punctured, of cranium, 63
Fracture of radius, 318
Fracture of ribs, 346
Fracture of scapula at its neck, 313
Fracture of spine, 334
Fracture of sternum, 347
Fracture of tarsal bones, 660
Fracture of ulna, 317
Fractures at ankle, 660
Fractures, compound, of leg, 659
Fractures, compound, of thigh, 655
Fractures of foot, 661
Fractures of tibia, 657
Frænum linguæ, division of, 216
Frontal sinus, polypus of, 85
Fungus of testicle, 567
Fusible calculus, 449

Ganglia in forearm and wrist, 298
Galactirrhœa, 362
Gastrocnemius muscle, rupture of, 673
Gastrocnemius muscle, laceration of, 674
Gastrostomy, 382
Gastrotomy, 382
Genital organs, affections of female, 591
Gland, lachrymal, affections of, 110
Gland, lachrymal, atrophy of, 111
Gland, lachrymal, tumors of, 111
Gland, parotid, tumors of, 187
Gland, thyroid, affections of, 281
Gland, thyroid, tumors over the, 285
Glaucoma, 154
Glaucoma and amaurosis distinguished from cataract, 144
Glandular enlargement of neck, 245
Glenoid cavity, fracture of, 313
Glossitis, 213
Glottis, spasm of, 264
Goitre, 281
Gonorrhœa, 514
Gonorrhœa in the female, 522
Gonorrhœa præputialis, 521
Gonorrhœa spuria, 515
Gonorrhœa, accidents of, 515
Gonorrhœa, treatment of, 516
Gonorrhœal ophthalmia, 118, 521
Gonorrhœal lichen, 521
Gonorrhœal orchitis, 565
Gorget, 481
Grando, 94
Granular conjunctiva, 119
Gravel, 441
Great toe, exostosis of, 681
Great toe, amputation of, 695
Gums, recession of, 203
Gums, tumors of, 205
Gumboil, 205

Hæmatocele of neck, 245
Hæmatocele of scrotum, 576
Hæmatocele of spermatic cord, 577
Hæmatocele of tunica vaginalis, 577
Hæmato-thorax, 350
Hæmaturia, 491
Hæmaturia from kidney, 491
Hæmaturia from bladder, 492
Hæmaturia from urethra, 493
Ham, affections of, 643
Ham, abscess of, 643
Ham, tumors of, 644
Hand, deformities of, 303
Hand, affections of, 298
Hare-eye, 96
Harelip, 190
Harelip, single, 190
Harelip, double, 191
Harelip, complicated, 192
Heart, wounds of, 359
Hemorrhage after extraction of teeth, 203
Hemorrhage after lithotomy, 476
Hemorrhage from ear, 242
Hemorrhage from rectum, 428
Hemorrhage from stumps, 706
Hemorrhoids, 419
Hemiopia, 142
Hernia, 386
Hernia bronchalis, 285
Hernia, causes of, 386
Hernia cerebri, 71; prevention of, 71: cure of, 71
Hernia, component parts of, 386
Hernia, congenital, 405
Hernia, coverings of, 386
Hernia, diagnosis of, 387
Hernia, diaphragmatic, 410
Hernia, direct inguinal, 405
Hernia, enterocele, 387
Hernia, epiplocele, 387
Hernia, entero-epiplocele, 387
Hernia, femoral, 406

Hernia humoralis, 565
Hernia, incarcerated, 392
Hernia infantilis, 405
Hernia, intermuscular inguinal, 404
Hernia, irreducible, 391
Hernia, ischiatic, 410
Hernia littrica, 387, 410
Hernia of the lungs, 347
Hernia, oblique inguinal, 408
Hernia, obturatorial, 410
Hernia of the cornea, 125
Hernia, perineal, 410
Hernia, phrenic, 410
Hernia, radical cure of, 390
Hernia, reducible, 389
Hernia, scrotal, 408
Hernia, strangulated, 392
Hernia, strangulated, operation for, 399
Hernia, umbilical, 409
Hernia, vaginal, 409
Hernia, ventral, 409
Hernia, ventro-inguinal, 405
Hernial hydrocele, 576
Hernial contents, 387
Hernial sac, 387
Herpes of penis, 523
Hey's amputations of foot, 696
Hip, dislocation of, 661
Hip, dislocation of, upwards, 662
Hip, dislocation of, backwards, 664
Hip, dislocation of, downwards, 665
Hip, dislocation of, forwards, 666
Hip, anomalous dislocations of, 667
Hip-joint, amputation of, 703
Hip-joint, change of form in, 688
Hip-joint, disease of, 635
Hip-joint, resection of, 642
Hordeolum, 93
Housemaid's knee, 648
Humeral artery, ligature of, 292
Humerus, condyles, fracture of, 316
Humerus, dislocation of the, at the shoulder, 325
Humerus, fracture of, 314
Humerus, fracture of neck of, 314
Humerus, fracture of shaft of, 315
Humors of eye, affections of, 154
Hunterian, or true chancre, 528
Hunter's forceps, 483
Hydrocele, 571
Hydrocele, congenital, 574
Hydrocele, diagnosis of, 571
Hydrocele, encysted, 574
Hydrocele, hernial, 576
Hydrocele in the female, 576
Hydrocele of the cord, 575
Hydrocele of the neck, 245
Hydrocele of tunica vaginalis, 571
Hydrophthalmia, 154
Hydrorachitis, 344
Hydrothorax, 352
Hydro-sarcocele, 572
Hymen, imperforate, 608
Hyo-thyroid bursa, enlargement of, 285
Hyperspadias, 589
Hypertrophy of the auricle, 243
Hypertrophy of clitoris and nymphæ, 594
Hypertrophy of the eyelid, 95
Hypertrophy of the fingers, 303
Hypertrophy of the mamma, 363
Hypertrophy, partial, of the mamma, 363
Hypertrophy of the tongue, 214
Hypertrophy of the tonsils, 222
Hyposema, 135
Hypopion, 135
Hypospadias, 588

Iliacs, deligation of, 626
Iliac, common, deligation of, 628
Iliac, external, deligation of, 626
Iliac, internal, deligation of, 627
Ilium, fracture of, 645
Imperforate anus, 430
Imperforate urethra, 589
Incarcerated hernia, 392
Incisions, mode of making, 18
Incontinence of urine, 493
Induration of the tongue, 214
Infantile hernia, 405
Inflammation, orbital, 88
Inguinal bubo, 536
Inguinal hernia, 404
Inguinal hernia, intermuscular, 405
Inguinal hernia, direct, 405
Injuries of the cranium, 32
Imperforate vagina or hymen, 608
Impotence, 580
Instruments, use of, 18
Intercostal artery, wound of, 348
Intestines, injuries of, 369
Inversion of uterus, 612
Iris, affections of, 132
Iris, adhesions of the, 135
Iris, tremulous, 137
Iritis, 132
Iritis, rheumatic and arthritic, 136
Iritis, strumous, 136
Iritis, syphilitic, 136
Irritable bladder, 490
Irritable mamma, 361
Irritable testicle, 570
Ischiatic hernia, 410
Ischium, fracture of, 645
Itching of the anus, 428

Jaws, affections of, 205
Jaw, anchylosis of the, 212
Jaw, lower, caries and necrosis of, 210
Jaw, lower, dislocation of, 211
Jaw, lower, extirpation of, 207
Jaw, lower, fracture of, 210
Jaw, lower, tumors of, 206
Jaw, upper, extirpation of, 182
Jaw, upper, tumors of, 181
Jaw, upper, large osteosarcoma of, 181
Joints of lower extremity affections of, 635
Jugular vein, external opening of the, 252

Knee, affections of, 643
Knee-joint, amputation of, 701

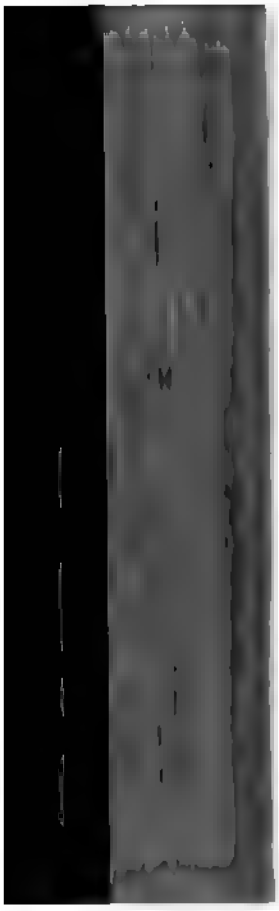
Lallemand, M., his porte-caustique, 560
Lagophthalmos, 96
Laryngeal ulceration, 271
Laryngismus stridulus, 264
Laryngotomy, 276
Laryngitis, acute, 265
Laryngitis, chronic, 269
Laryngitis, chronic, thickening of mucous membrane from, 269
Laryngitis fibrinosa, 267
Laryngitis purulenta, 269
Laryngitis œdematosa, 265
Laryngitis simplex, 265
Larynx, apoplexy of the, 263
Larynx, follicular disease of the, 270
Larynx, formation of matter near the, 274
Larynx, diseased cartilage of, 272
Larynx, injury of, 262
Larynx, stricture of, 273
Larynx, ulceration of the, 271
Larynx, warts of, 278
Leg, amputation of, 700
Leg, fractures of, 657
Leg, compound fractures of, 659
Lens and capsule, affections of the crystalline, 143
Leucoma, 126
Leucorrhœa, diagnosis of, 607
Lipoma of the nose, 162
Lippitudo, 93
Lips, affections of, 190
Lips, ulcers of, 192
Lithate of soda calculus, 450
Lithectasy, 482
Lithic diathesis, 438
Lithic deposit, 438
Lithontriptics, 451
Lithotripsy, 464
Lithotrity, 464
Lithotomy, 469
Lithotomy, aggravation of renal disease by, 478
Lumbar abscess, 343
Lungs, wounds of, 349
Lungs, hernia of the, 347
Lupus, 172
Malar bone, fracture of,
Malleoli, fracture of, 660
Mamma, affections of, 361
Mamma, chronic abscess
Mamma, fungus hæmatod
Mamma, extirpation of, 3
Mamma, hypertrophy of,
Mamma, irritable, 361
Mamma, lacteal tumor of,
Mamma, malignant tumor
Mamma, partial hypertro
Mamma, tumors of, 364
Mamma, tumors external
Mammilla, affections of, 3
Mammitis, 361
Mammitis, acute, 361
Mammitis, chronic, 361
Mastoid cells, abscess of,
Maxilla, superior, affectio
Maxilla, extirpation of su
Maxilla, tumors of the, 18
Meatus auditorius, conge the, 243
Medullary nasal polypi, 1
Membrana tympani, perfo
Meningeal artery, injury
Mercury, effects of, 545
Mercurio-syphilitic ulcers
Mercury, use of, in syphil
Metacarpal bones, affectio
Metacarpal bones, amputa
Metacarpal bones, fractur
Metacarpal bone of little f of, 690
Metacarpal bones, tumors
Metatarsal bone of great t 695

Mydriasis, 136
Myocephalon, 125
Myosis, 137

Nail, diseased matrix of, 300
Nasal bones, fracture of, 162
Nasal duct, absence of the, 110
Nasal duct, obliteration of, 110
Nasal duct, obstruction of, 109
Nasal polypus, 163
Nasal tubes, passing of, 170
Nebula, 126
Neck, abscess of, 245
Neck, affections of, 245
Neck, affections of the arteries of, 287
Neck, glandular enlargement of, 245
Neck, hydrocele of the, 245
Neck, suspension by the, 262
Neck, tumors of, 251
Neck, wounds of, 254
Necrosis of skull, 83
Neuralgia of the face, 187
Neuralgia of the ear, 239
Neuralgia of stumps, 704
Nipple, affections of, 366
Noli me tangere, 172
Noma, 591
Nose, affections of, 162
Nose, dense fibrous polypus of, 166
Nose, erectile tumor of, 167
Nose, lipoma of, 162
Nose, partial restoration of, 176
Nose, polypus of the, 163
Nostrils, foreign bodies in, 170
Nostrils, plugging of, 168
Nostrils, ulcers of, 171
Nymphæ, hypertrophy of, 594

Oblique inguinal hernia, 403
Obliteration of vagina, 603
Occlusion of the pupil, 137; three modes of operation, 138
Œdema glottidis, 265
Œdema glottidis, chronic, 270
Œdema of the uvula, 220
Œsophagitis, 230
Œsophagotomy, 233
Œsophagus, affections of the, 230
Œsophagus, foreign bodies in, 231
Œsophagus, palsy of the, 234
Œsophagus, stricture of, 230
Olecranon, fracture of, 317
Olecranon, affections of bursa over, 297
Omalgia, 304
Onychia, 300
Onyx, 123
Onyxis, 300
Operations, 17
Ophthalmia, 112
Ophthalmia, gonorrhœal, 118
Ophthalmia, neonatorum, 118
Ophthalmia, purulent, two varieties of, 115
Ophthalmia tarsi, 93
Ophthalmitis, 155
Orbit, affections of, 88
Orbit, tumors of, 89
Orbit, wounds of, 88
Orbital inflammation, 88
Orchitis, 565
Orchitis, acute, 565
Orchitis, chronic, 567
Os calcis, dislocation of, 672
Oscheocele, 403
Osteocephaloma, 181
Osteocystoma, 206
Osteoma, 206
Osteosarcoma, large, of upper jaw, 181
Otalgia, 239
Otitis, 236
Otitis, external and internal, 236
Otoplastics, 243
Otorrhœa, 237
Ovarian dropsy, 374
Ovarian tumors, 374
Ovariotomy, 379
Oxalata of lime calculus, 448
Oxalic diathesis, 441
Ozæna, 172

Palate, affections of, 196
Palate, congenital deficiency of, 196
Palate, ulcer and exfoliation of, 199
Palmar arch, wounds of, 294
Palmar fascia, contraction of, 301
Palsy of the œsophagus, 234
Pannus, 121
Paracentesis abdominis, 377
Paracentesis capitis, 76
Paracentesis pericardii, 359
Paracentesis thoracis, 352
Paraphymosis, 587
Paralysis of the pharynx, 227
Paronychia, 299
Parotid, tumors of, 187
Parulis, 205
Patella, compound fractures of, 657
Patella, dislocations of, 669
Patella, fractures of, 656
Patella, longitudinal fracture of, 656
Patella, transverse fracture of, 656
Pelvic abscess, 373
Pelvis, dislocation of, 661
Pelvis, fracture of, 645
Pendulous breast, 363
Penis, affections of, 583
Penis, amputation of, 590
Penis, bubo of, 536
Penis, herpes of the, 523
Penis, malignant disease of, 589
Penis, warts on the, 521
Perforation of membrana tympani, 242
Pericranitis, 81
Perineal fistula, 563
Perineal hernia, 409
Perineum, laceration of, 595
Peritonitis, after lithotomy, 477
Perityphlitis, 373
Peroneal artery, deligation of, 634
Phagedæna, sloughing, 530
Phagedænic syphilis, 530



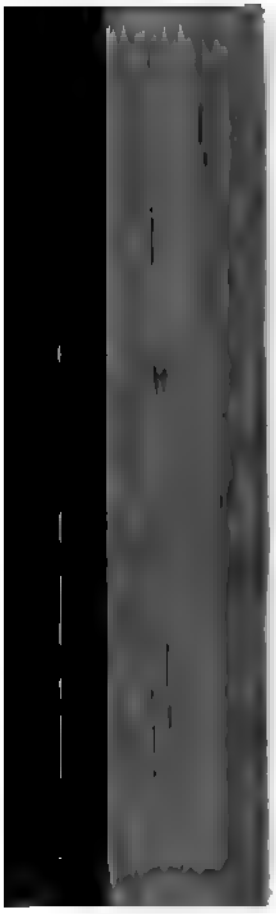
Pharynx, tumors of, 227
Phosphatic diathesis, 443
Phosphate of lime calculus, 448
Phthisis laryngea, 272
Phymosis, 585
Piles, 381
Piles, blind, 419
Piles, external, 419
Piles, internal, 420
Pleura, wounds of, 348
Plugging of the nostrils, 168
Plugging of the vagina, 606
Pneumothorax, 351
Pneumocele, 347
Podelkoma, 679
Polypus of the antrum, 180
Polypus of the frontal sinus, 85
Polypus, dense fibrous, of nose, 166
Polypus of the ear, 285
Polypus of the nose, 163
Polypus of the rectum, 428
Polypus of the uterus and vagina, 618
Popliteal aneurism, 629
Popliteal artery, deligation of, 631
Preputial calculus, 485
Pressure in treatment of aneurism, 629
Priapism, 584
Probang, use of, 226, 231
Prolapsus ani, 423
Prolapsus uteri, 614
Prolapsus vaginæ, 604
Prostate, affections of, 509
Prostate, abscess of, 509
Prostate, enlargement of, 510
Prostate, malignant tumors of, 513
Prostatic calculus, 485
Prostatitis, 509
Protesting bougie, 554
Pruritus of the vulva, 593
Pseudo-syphilis, 548
Psoas abscess, 343
Pterygium, 121

Radius and ulna, fractur
Radius, fracture of, 318
Radial artery, ligature of
Ramollissement of spinal
Ranula, 216
Reclination of cataract, 1
Rectal fistula after lithot
Rectitis, 412
Rectocele, vaginal, 604
Recto-vaginal fistula, 601
Rectum, abscess exterior
Rectum, affections of, 41
Rectum, foreign bodies i
Rectum, hemorrhage fro
Rectum, injuries of, 429
Rectum, irritable, 427
Rectum, itching of, 428
Rectum, malignant strict
Rectum, medullary tumo
Rectum, polypus of, 423
Rectum, scirrho-contract
Rectum, stricture of, 425
Rectum, simple organic s
Rectum, spasmodic strict
Renal calculi, 452
Resection of ankle, 697
Resection of elbow-joint,
Resection of hip-joint, 64
Resection of shoulder-joi
Resection of the wrist, 3
Retention of urine, 495
Retention of urine, from
neum, 497
Retention of urine from p
Retention of urine from bl
499
Retention of urine from c
Retention of urine from
499
Retention of urine from in
500
Retention of urine from i

Retina, affections of, 141
Retinitis, 141
Retro-uterine sanguineous tumors, 374
Rheumatic iritis, 136
Rhinolithes, 167
Rhinoplastics, 173
Ribs, caries and necrosis of, 347
Ribs, dislocation of, 347
Ribs, fracture of, 346
Ruspini's styptic, 168

Sacrum, fracture of, 645
Salivary concretions, 219
Salivary fistula, 188
Sarcocele, 570
Sanguineous, retro-uterine, tumors, 374
Scalp, bruise of, 22
Scalp, erectile tumors of, 80
Scalp, erysipelas of, 78
Scalp, contused and lacerated wounds of, 28
Scalp and cranium, diseases of, 78
Scalp, malignant tumors of, 81
Scalp, malignant ulcer of, 81
Scalp, punctured wounds of, 29
Scalp, simple incised wounds of, 27
Scalp, solid tumors of, 80
Scalp, tumors of, 79
Scalp, wounds of, 27
Scarpa's needle, 150
Scapula, amputation of, 695
Scapula, displacement of angle of, 324
Scapula, fracture of body of, 312
Scapula, fracture of neck of, 313
Schneiderian membrane, simple ulceration of, 171
Schneiderian membrane, congestion of, 170
Scirrho-contracted rectum, 427
Sclerotic, staphyloma of, 130
Sclerotitis, 130
Sclerotic coat, affections of, 130
Scrofulous testicle, 569
Scrotal hernia, 403
Scrotum, affections of, 583
Scrotum, cancer of, 584
Scrotum, elephantiasis of, 583
Scrotum, erysipelas of, 583
Scrotum, hæmatocele of, 576
Secondary symptoms of syphilis, 523, 538
Semilunar cartilages, displacement of, 668
Septum narium, abscess of, 171
Searcher, 474
Shoulder, amputation of, 694
Shoulder, dislocation of, 325
Shoulder, subluxation of, 327
Shoulder-joint, disease of, 304
Shoulder-joint, resection of, 305
Signoroni's compressor, 683
Sinus, frontal, polypus of the, 85
Sinus of the cheek, 188
Skull, caries of the, 82
Skull, exfoliation of, 83
Skull, necrosis of the, 83
Sloughing phagedæna, 530
Sloughing ulcer, 530
Sounding, 458

Spasm of the face, 186
Spasm of the glottis, 264
Spasm of the pharynx, 226
Spermatic cord, hæmatocele of, 577
Spermatic cord, tumors of, 579
Spermatic fistula, 569
Spermatorrhœa, 581
Spina ventosa, 206
Spine, affections of, 333
Spine, causes of lateral curvature of, 337
Spine, caries of, 341
Spine, curvature of, 337
Spine, dislocation of, 336
Spine, fracture of, 335
Spine, malignant disease of, 345
Spina bifida, 344
Spinal cord, compression of, 334
Spinal cord, concussion of, 333
Spinal cord, ramollissement of, 333
Spinal cord, softening of, 333
Spinal fissure, 336
Split palate, 196
Sprains of lower extremity, 673
Squinting, 157
Squinting, varieties of, 157; convergent, divergent, 157
Stammering, 216
Staphyloma of the cornea, 127
Staphyloma of the sclerotic, 130
Staphyloraphe, 196
Sterno-cleido-mastoid, division of, 253
Sternum, caries and necrosis of, 347
Sternum, fracture of, 347
Stillicidium lacrymarum, 105
Stomach-pump, use of, 234
Stone in the bladder, 454
Stone in the bladder, treatment of, 458
Stone, boring of, 463
Stone, crushing of, 464, 480
Stone, disintegration of, medicinally, 461
Stone, evulsion of, 463
Stone, excision of, 469
Stone, natural expulsion of, 460
Stone, snaring of, 463
Strabismus, 157
Strabismus, congenital, 159
Strangulation of hernia, 392
Strangulated hernia, operation for, 399
Stricture of cervix uteri, 617
Stricture of the œsophagus, 230
Stricture of the pharynx, 225
Stricture of the rectum, 425
Stricture of the urethra, symptoms of, 554
Stricture of the urethra, treatment of, 552
Stricture of the urethra, use of bougie in, 553
Stricture of the urethra, 549
Stricture of the vagina, 603
Stricture of the windpipe, 273
Strumous conjunctivitis, 119
Strumous iritis, 136
Stumps, affections of, 704
Stumps, bursæ over, 705
Stumps, exfoliation from, 704
Stumps, hemorrhage from, 706
Stumps, neuralgia of, 704



Syphilis, common sores in, 524
Syphilis in the child, 547
Syphilis in the female, 547
Syphilis, primary, 523, 538
Syphilis, secondary symptoms of, 538
Syphilis, simple abraston in, 524
Syphilis, tertiary symptoms of, 540
Syphilis, use of mercury in, 542
Syphilitic iritis, 136
Syphilitic testicle, 567

Talipes, 675
Talipes calcaneus, 676
Talipes equinus, 675
Talipes, spurious, 676
Talipes, treatment of, 677
Talipes valgus, 676
Talipes varus, 676
Tarsus, dislocation of, 671
Tarsus, fracture of, 660
Tartar on Teeth, 203
Taxis, 395
Taxis, auxiliaries to the, 396
Teeth, affections of, 200
Teeth, caries of, 200
Teeth, crowded, 200
Teeth, extraction of, 202
Teeth, hemorrhage after extraction of, 203
Teeth, injuries of the, 204
Teeth, tartar on the, 203
Temporal artery, aneurism of, 31
Temporal artery, ulcer of, 31
Temporal artery, wounds of, 30
Tendo Achillis, rupture of, 673
Tendo Achillis, ununited, 674
Tendo Achillis, wounds of, 674
Tendo Achillis, injuries of the, 673
Tertiary symptoms of syphilis, 540
Testicle, affections of, 565
Testicle, atrophy of, 571
Testicle, descent of, 388
Testicle, fungus of, 567

Toes, amputation of, 696
Toes, contraction of, 681
Toes, dislocation of, 672
Toes, exostosis of, 681
Tongue, affections of, 213
Tongue, erectile tumor of
Tongue, encysted tumors
Tongue, fatty tumors ben
Tongue, hypertrophy of,
Tongue, induration of, 21
Tongue, removal of porti
Tongue-tie, 216
Tongue, tumors beneath,
Tongue, ulcers of, 213
Tongue, wounds of, 213
Tonsillitis, 221
Tonsils, abscess of, 221
Tonsils, hypertrophy of,
Tonsils, malignant disea
Tonsils, ulcers of, 222
Toothache, 201
Torticollis, 252
Trachea, rupture of the,
Tracheal fistula, 272
Tracheotomy, 277
Tremulous iris, 137
Trephining, 66
Trichiasis, 97
Trochanters, fracture of,
Truss, 390
Tumor, chronic mammary
Tumor, lacteal, 368
Tumor, medullary, of rect
Tumor, oozing, of labium
Tumors of the antrum, 18
Tumors of the bladder, 50
Tumors of the cheek, 181
Tumors of the eyeball, 16
Tumors of the ham, 644
Tumors of the labia, 594
Tumors of the lachrymal
Tumors of the lower jaw,

Tumors, solid, of the scalp, 80
Tumors, malignant, of the scalp, 81
Tumors, erectile, of the scalp, 80
Tumors of the calvarium, 85
Tumors, soft, of orbit, 89
Tumors, encysted, of the eyelids, 94
Tumors, erectile, of nose, 167
Tumors of superior maxilla, 181
Tumors of parotid gland, 187
Tumors over parotid gland, 188
Tumors, malignant, of mamma, 364
Tumors external to the mamma, 366
Tumors over thyroid gland, 285
Tumors of the abdominal parietes, 368
Tumors of the uterus, 374, 381
Tumors, fibrous, of the uterus, 381
Tumors of spermatic cord, 579
Tumors, hard, of orbital parietes, 89
Tunica vaginalis testis, hydrocele of, 571
Tunica vaginalis, hæmatocele of, 577
Tympanum, perforation of, 242

Ulcer of the anus, 417
Ulcer and exfoliation of the palate, 199
Ulcer, cancerous, of the nose, 173
Ulcer after arteriotomy, 31
Ulcer of the cornea, 124
Ulcer, malignant, of the scalp, 81
Ulcer, phagedænic, 530
Ulcer, sloughing, 530
Ulcer, simple venereal, 524
Ulcer, venereal, with elevated edges, 527
Ulcers of the lips, 192
Ulcers of the lips, malignant, 193
Ulcers, mercurio-syphilitic, 174
Ulcers of nostrils, 171
Ulcers of the tonsils, 222
Ulcers of the tongue, 213
Ulceration of cervix uteri, 608
Ulceration of the larynx, 271
Ulceration, simple, of Schneiderian membrane, 171
Ulceration, tubercular, of windpipe, 272
Ulna, dislocation of, 328
Ulna, dislocation of, at the elbow, 328
Ulna, dislocation of, at the wrist, 331
Ulna, fracture of, 317
Ulnar artery, deligation of, 293
Umbilical hernia, 409
Ununited tendo Achillis, 674
Urethra, affections of, 549
Urethra, false passage in, 555
Urethra, hæmaturia from the, 493
Urethra, imperforate, 589
Urethra, laceration of, 564
Urethra, stricture of, 549
Urethra, vascular excrescence in, 594
Urethral calculus, 483
Urethral extravasation of urine, 503
Urethro-vaginal fistula, 601
Uric calculus, 447
Uric deposit, 438
Uric or xanthic oxide calculus, 450
Uric diathesis, 440
Urinary calculi, 436
Urinary calculi, formation and varieties of, 446
Urinary deposits, tests of, 436
Urinary fistula, 563
Urinary infiltration after lithotomy, 478
Urine, characters of the, 436
Urine, extravasation of, 502
Urine, incontinence of, 498
Urine, mucous, 437
Urine, pathology of, 436
Urine, retention of, 495
Urine, retention of, in the female, 500
Urine, vesical extravasation of, 502
Urine, urethral extravasation of, 503
Urinous abscess, 562
Uterus, cancer of, 622
Uterus, cauliflower excrescence of, 621
Uterus, corroding ulcer of, 621
Uterus, displacements of, 616
Uterus, fibrous tumors of, 381
Uterus, inversion of, 612
Uterus, malignant disease of, 621
Uterus, removal of neck of, 620
Uterus, polypi of, 618
Uterus, prolapsus of, 614
Uvula, œdema of the, 221
Uvula, elongation of, 221
Uvula and tonsils, affections of the, 221

Vaginitis, 607
Vagina, foreign bodies in, 604
Vagina, imperforate, 603
Vagina, obliteration of, 603
Vagina, plugging of, 606
Vagina, polypi of, 618
Vagina, prolapsus of, 604
Vagina, stricture of, 603
Vaginal hernia, 409
Vaginal rectocele, 604
Vaginal cystocele, 604
Vaginal fistula, 595
Variocele, 577
Vein, jugular, opening of, 252
Velosynthesis, 196
Venereal disease, 514
Venereal disease, general view of, 538
Venereal ulcer with elevated edges, 527
Venereal ulcer, simple, 524
Venesection at the bend of the arm, 295
Venesection, accidents of, 296
Venesection in the neck, 252
Ventral hernia, 409
Ventro-inguinal hernia, 405
Vertebræ, caries of the, 341
Vertebræ, cervical, disease of, 285
Vertebræ, continuous absorption and simple ulceration in bodies of, 341
Vertebræ, diseases of, 341
Vertebræ, interstitial absorption of bodies of, 341
Vesical extravasation of urine, 502
Vesical calculus, 434
Vesical calculus, palliation of, 483
Vesical calculus, treatment of, 558
Vesico-vaginal fistula, 595

Whitlow, 298
Windpipe, diseases of, 265
Windpipe, foreign bodies in, 258
Windpipe, passing of tubes into the, 276
Windpipe, stricture of the, 273
Windpipe, tubercular ulceration of, 272
Wounds of the bowels, 369
Wounds of the brain, 69
Wounds of the chest, 348
Wounds of the eyeball, 155
Wounds of the tongue, 213
Wrist, amputation of, 691
Wrist and hand, affections of, 1
Wrist, dislocation of, 880
Wrist, resection of, 808
Writers' cramp, 301
Wry-neck, 252

Xanthic oxide deposit, 446
Xeroma, 105

THE END.

MARCH, 1853.

CATALOGUE

OF

MEDICAL AND SURGICAL WORKS,

PUBLISHED BY

BLANCHARD & LEA,

PHILADELPHIA,

AND

FOR SALE BY ALL BOOKSELLERS.

ILLUSTRATED MEDICAL CATALOGUE.

BLANCHARD & LEA have now ready a Catalogue of their Medical and Surgical Publications, containing descriptions of the works, with Notices of the Press and specimens of the Illustrations, making a pamphlet of forty-eight large octavo pages. It has been prepared with great care, and without regard to expense, forming one of the most beautiful specimens of typographical execution as yet issued in this country. Copies sent by mail, free of postage, to Physicians, on application to the Publishers.

TO THE MEDICAL PROFESSION.

The Subscribers subjoin a list of their publications in medical and other sciences, to which they would invite the attention of the Profession, with the full confidence that they will be found to correspond in every respect with the description. They are to be had of all the principal booksellers throughout the Union, from whom, or from the publishers particulars respecting price, &c., may be had on application.

Philadelphia, March, 1853. BLANCHARD & LEA.

DICTIONARIES, JOURNALS, &c.

American Journal of the Medical Sciences, quarterly, at $5 a year.

Cyclopædia of Practical Medicine, by Forbes, Tweedie, &c., edited by Dunglison, in 4 super royal volumes, 3154 double-columned pages.

Dunglison's Medical Dictionary, 9th ed., 1 vol. imp. 8vo., 928 large pages.

Hoblyn's Dictionary of Medical Terms, by Hays, 1 vol. large 12mo., 402 pages, double columns.

Neill and Smith's Compend of the Medical Sciences, 2d ed., enlarged, 1 vol., large 12mo., 1000 pp., 350 cuts.

Medical News and Library, monthly, at $1 a year.

ANATOMY.

Anatomical Atlas, by Smith and Horner, large imp. 8vo., 650 figures. New and cheaper ed.

Horner's Special Anatomy and Histology, new edition, 2 vols. 8vo., many cuts.

Horner's United States Dissector, 1 vol. large royal 12mo., many cuts, 444 pages.

Maclise's Surgical Anatomy, now complete in 1 large imp. 4to. vol., strongly bound, with 68 magnificent colored plates.

Sibson's Medical Anatomy, imp. 4to., with col'd pl's, to match "Maclise." Part I, (preparing.)

Sharpey and Quain's Anatomy, by Leidy, 2 vols. 8vo., 1300 pages, 511 wood-cuts.

Wilson's Human Anatomy, by Goddard, 4th edition, 1 vol. 8vo., 252 wood-cuts, 580 pp.

Wilson's Dissector, by Goddard. New edition, with cuts, 1 vol. 12mo., 458 pages.

PHYSIOLOGY.

Carpenter's Principles of Human Physiology. By F. G. Smith. 1 large vol. 8vo., many illustrations, new and improved edition, (Now ready.)

Carpenter's Elements, or Manual of Physiology, new and improved ed., 1 vol. 8vo., 566 pp.

Carpenter's General and Comparative Physiology, 1 vol. 8vo., (new edition, preparing.)

Carpenter on the Varieties of Mankind, 1 vol. royal 12mo., with illustrations, (preparing.)

Dunglison's Human Physiology, 7th edition, 2 vols. 8vo., 1428 pages, and 472 wood-cuts.

Harrison on the Nerves, 1 vol. 8vo., 292 pages.

Kirkes and Paget's Physiology, 1 vol. 12mo., many cuts, 550 pages.

Longet's Physiology. Translated by F. G. Smith. 2 vols. 8vo., many cuts, (preparing.)

Matteucci on the Physical Phenomena of Living Beings, 1 vol. 12mo., 388 pp., cuts.

Solly on the Brain, 1 vol. 8vo., 496 pp., 118 cuts.

Todd and Bowman's Physiology. Parts I., II. and III., 1 vol. 8vo., 156 cuts. Part IV, (publishing in the Med. News and Library for 1853.)

PATHOLOGY.

Abercrombie on the Brain, 1 vol. 8vo., 324 pp.

Blakiston on Diseases of the Chest, 1 vol., 384 pp.

Blood and Urine Manuals, by Reese, Griffith, and Markwick, 1 vol. 12mo., with plates.

Budd on the Liver, 1 vol. 8vo., 392 pages, plates and cuts, new and improved ed., (just ready.)

Burrows on Cerebral Circulation, 1 vol. 8vo., 216 pages, with 6 colored plates.

Billing's Principles, new and improved edition, 1 vol. 8vo., 250 pages, (just issued.)

Bird on Urinary Deposits, 12mo., new and improved edition, (just issued.)

Copland on Palsy and Apoplexy, 12mo., 236 pp.

Frick on Renal Affections, 1 vol. 12mo., cuts.

Gluge's Pathological Histology, 1 vol. imp. 4to., with colored plates, (now ready.)

Hasse's Pathological Anatomy, 8vo., 379 pages.

Hope on the Heart, new ed., pl's, 1 vol. 8vo., 372 p.

Philips on Scrofula, 1 vol. 8vo., 350 pages.

Ricord on Venereal, new ed., 1 vol. 8vo., 360 pp.

Rokitansky's Pathological Anatomy, 2 vols. 8vo., (preparing.)

Stanley on the Bones, 1 vol. 8vo., 236 pages.

Simon's General Pathology, 1 vol. 8vo.

Whitehead on Sterility and Abortion, 1 vol. 8vo., 368 pages.

Williams' Principles of Medicine, by Clymer, 2d edition, 440 pages, 1 vol. 8vo.

Williams on the Respiratory Organs, by Clymer, 1 vol. 8vo., 500 pages.

PRACTICE OF MEDICINE.

Ashwell on Females, 2d ed., 1 vol. 8vo., 520 pp.

Barlow's Practice of Medicine, (preparing.)

Bennet on the Uterus, 3d edition, 1 vol. 8vo., 356 pages, (now ready.)

Bartlett on Fevers, 3d edition, 600 pages.

Benedict's Compendium of Chapman's Lectures, 1 vol. 8vo., 258 pages.

Chapman on Fevers, Gout, Dropsy, &c. &c., 1 vol. 8vo., 450 pages.

Colombat de L'Isère on Females, by Meigs, 1 vol. 8vo., 720 pages, cuts. New edition.

Condie on the Diseases of Children, 3d edition, 1 vol. 8vo.

Churchill on the Diseases of Infancy and Childhood, 1 vol. 8vo.

Churchill on the Diseases of Females, new ed., rev'd by the author, 1 vol. 8vo., (now ready.)

Churchill's Monographs of the Diseases of Females, 1 vol. 8vo., now ready, 450 pages.

Clymer on Fevers, in 1 vol. 8vo., 600 pages.

Day on Old Age, 1 vol. 8vo., 226 pages.

Dewees on Children, 9th ed., 1 vol. 8vo., 548 pp.

Dewees on Females, 9th ed., 1 vol. 8vo., 532 p. pls.

Dunglison's Practice of Medicine, 3d edition, 2 vols. 8vo., 1500 pages.

Meigs' Letters on Diseases of Females, 1 vol. 8vo., 690 pp., 2d ed., improved.

Meigs on Diseases of Infancy, 1 vol. 8vo., 216 pp.

Neligan on Diseases of the Skin, 1 vol. royal 12mo., (now ready.)

Thomson on the Sick Room, 12mo., 360 pages.

Wilson on the Skin, 1 vol. 8vo., 3d ed., 480 pp. Same work, with fifteen plates.

Wilson on Syphilis, 1 vol. 8vo., with beautiful colored plates, (now ready.)

Watson's Principles and Practice of Physic, 3d edition by Condie, 1 vol. 8vo., 1060 large pages.

West's Lectures on the Diseases of Infancy and Childhood. 1 vol. 8vo., 452 pp.

Walshe on the Heart and Lungs. A new work, now ready, 1 vol. royal 12mo. 512 pp.

What to Observe at the Bed-side.—A Clinical Manual, 1 vol. royal 12mo., (now ready.)

SURGERY.

Brodie on Urinary Organs, 1 vol. 8vo., 214 pages.

Brodie on the Joints, 1 vol. 8vo., 216 pages.

Brodie's Lectures on Surgery, 1 vol. 8vo., 350 pp.

Brodie's Select Surgical Works, 780 pp. 1 vol. 8vo.

Chelius' System of Surgery, by South and Norris, in 3 large 8vo. vols., near 2200 pages.

Cooper's (Bransby B.) Lectures on Principles and Practice of Surgery, 1 large vol. 8vo., 750 pp.

Cooper on Dislocations and Fractures, 1 vol. 8vo., 500 pages, many cuts, (new edition.)

Cooper on Hernia, 1 vol. imp. 8vo., many plates.

Cooper on the Testis and Thymus Gland, 1 vol. imperial 8vo., many plates.

Cooper on the Anatomy and Diseases of the Breast, Surgical Papers, &c. &c., 1 vol. imp. 8vo., pl's.

Druitt's Principles and Practice of Modern Surgery, 1 vol. 8vo., 576 pages, 193 cuts, 4th ed.
Duſton on the Ear, 1 vol. 12mo., 120 pages.
Durlacher on Corns, Bunions, &c., 12mo., 134 pp
Ear, Diseases of, a new work, (preparing.)
Fergusson's Practical Surgery, 1 vol. 8vo., 4th edition, 620 pages, 393 cuts, (now ready.)
Guthrie on the Bladder, 8vo., 150 pages.
Gross on Injuries and Diseases of Urinary Organs, 1 large vol. 8vo., 726 pp., many cuts.
Jones' Ophthalmic Medicine and Surgery, by Hays, 1 vol. 12mo., 529 pp., cuts and plates.
Liston's Lectures on Surgery, by Mütter, 1 vol. 8vo., 566 pages, many cuts.
Lawrence on the Eye, by Hays, 3d ed. much improved, many cuts, (nearly ready)
Lawrence on Ruptures, 1 vol. 8vo., 480 pages.
Miller's Principles of Surgery, 3d ed., by Sargent, much enlarged, 1 vol. 8vo., with beautiful cuts, (now ready.)
Miller's Practice of Surgery, 1 vol. 8vo., 496 pp.
Malgaigne's Operative Surgery, by Brittan, with cuts, one 8vo. vol., 600 pages.
Maury's Dental Surgery, 1 vol. 8vo., 286 pages, many plates and cuts.
Pirrie's Principles and Practice of Surgery, edited by Neill, 1 vol. 8vo., 316 cuts, (now ready.)
Skey's Operative Surgery, 1 vol. large 8vo., many cuts, 662 pages, a new work.
Sargent's Minor Surgery, 12mo., 380 pp. 128 cuts.
Smith on Fractures, 1 vol. 8vo., 200 cuts, 314 pp.

MATERIA MEDICA AND THERAPEUTICS.

Bird's (Golding) Therapeutics, (preparing.)
Christison's and Griffith's Dispensatory, 1 large vol. 8vo., 216 cuts, over 1000 pages.
Carpenter on Alcoholic Liquors in Health and Disease, 1 vol. 12mo.
Carson's Synopsis of Lectures on Materia Medica and Pharmacy, 1 vol. 8vo., 208 pp.
Dunglison's Materia Medica and Therapeutics, 4th ed., much improved, 182 cuts, 2 vols. 8vo.
Dunglison on New Remedies, 6th ed., much improved, 1 vol. 8vo., 750 pages.
De Jongh on Cod-Liver Oil, 12mo.
Ellis' Medical Formulary, 9th ed., much improved, 1 vol. 8vo., 268 pages.
Griffith's Universal Formulary, 1 vol. 8vo., 560 pp.
Griffith's Medical Botany, a new work, 1 large vol. 8vo., 704 pp., with over 350 illustrations.
Mayne's Dispensatory, 1 vol. 12mo., 330 pages.
Mohr, Redwood, and Procter's Pharmacy, 1 vol. 8vo., 550 pages, 506 cuts.
Pereira's Materia Medica, by Carson, 3d ed., 2 vols. 8vo., much improved and enlarged, with 400 wood-cuts. Vol. I, ready. Vol. II, in press.
Royle's Materia Medica and Therapeutics, by Carson, 1 vol. 8vo., 689 pages, many cuts.

OBSTETRICS.

Churchill's Theory and Practice of Midwifery, a new and improved ed., by Condie, 1 vol. 8vo., 510 pp., many cuts.
Dewees' Midwifery, 11th ed., 1 vol. 8vo., 660 pp., plates.
Lee's Clinical Midwifery, 12mo., 238 pages.
Meigs' Obstetrics, 2d ed., enlarged, 1 vol. 8vo., 752 pp.,
Ramsbotham on Parturition, with many plates, 1 large vol., imperial 8vo., 520 pp. 6th edition.
Rigby's Midwifery, new edi., 1 vol. 8vo., 422 pp.
Smith (Tyler) on Parturition, 1 vol. 12mo., 400 pp.

CHEMISTRY AND HYGIENE.

Bowman's Practical Chemistry, 1 vol. 12mo., 97 cuts, 350 pages.
Brigham on Excitement, &c., 1 vol. 12mo., 204 pp.
Beale on Health of Mind and Body, 1 vol. 12mo.
Bowman's Medical Chemistry, 1 vol. 12mo., many cuts, 288 pages.
Dunglison on Human Health, 2d ed., 8vo., 464 pp.
Fowne's Elementary Chemistry, 3d ed., 1 vol. 12mo., much improved, many cuts.
Graham's Chemistry, by Bridges, new and improved edition. Part 1, 432 pp., 185 cuts, (now ready.)
Gardner's Medical Chemistry, 1 vol. 12mo. 400 pp.
Griffith's Chemistry of the Four Seasons, 1 vol. royal 12mo., 451 pages, many cuts.
Lehman's Physiological Chemistry, translated by Day, 1 vol. large 8vo., (preparing.)
Knapp's Chemical Technology, by Johnson, 2 vols. 8vo., 936 pp., 460 large cuts.

MEDICAL JURISPRUDENCE, EDUCATION, &c.

Bartlett's Philosophy of Medicine, 1 vol. 8vo.
Bartlett on Certainty in Medicine, 1 vol. 12mo.
Dickson's Essays on Life, Pain, Sleep, &c., in 1 vol. royal 12mo., 300 pages.
Taylor's Medical Jurisprudence, by Griffith, 1 vol. 8vo., new edition, 670 pp.
Taylor on Poisons, by Griffith, 1 vol. 8vo., 688 pp.

NATURAL SCIENCE, &c.

Arnott's Physics, 1 vol. 8vo., 484 pp., many cuts.
Ansted's Ancient World, 12mo., cuts, 382 pp.
Bird's Natural Philosophy, 1 vol. royal 12mo., 402 pages and 372 wood-cuts.
Brewster's Optics, 1 vol. 12mo. 423 pp. many cuts.
Broderip's Zoological Recreations, 12mo., 376 p.
Coleridge's Idea of Life, 12mo., 94 pages.
Carpenter's General and Comparative Physiology, 1 large 8vo. vol., many wood-cuts.
Dana on Zoophytes, being vol. 8 of Ex. Expedition, royal 4to., extra cloth.
Atlas to "Dana on Zoophytes," im. fol., col. pl's.
Gregory on Animal Magnetism, royal 12mo.
De la Beche's Geological Observer, 1 large 8vo. vol., many wood-cuts.
Hale's Ethnography and Philology of the U. S. Exploring Expedition, in 1 large imp. 4to. vol.
Herschel's Treatise on Astronomy, 1 vol. 12mo., 417 pages, numerous plates and cuts.
Herschel's Outlines of Astronomy, 1 vol. small 8vo., plates and cuts, new edition, (now ready.)
Humboldt's Aspects of Nature, 1 vol. 12mo., new edition.
Johnston's Physical Atlas, 1 vol. imp. 4to., half bound, 25 colored maps.
Knox on Races of Men, 1 vol. 12mo.
Lardner's Handbooks of Natural Philosophy, First Course, 1 vol. royal 12mo., with 426 cuts. Second Course, 1 vol. royal 12mo., 250 cuts, (now ready.) Third Course (Astronomy) preparing.
Müller's Physics and Meteorology, 1 vol. 8vo., 636 pp., with 540 wood-cuts and 2 col'd plates.
Small Books on Great Subjects, 12 parts, done up in 3 handsome 12mo. volumes.
Schoedler and Medlock's Book of Nature, 1 vol. crown 8vo., 600 wood-cuts, (nearly ready.)
Somerville's Physical Geography, 1 vol. 12mo., cloth, 540 pages, enlarged edition.
Weisbach's Mechanics applied to Machinery and Engineering, Vol. I. 8vo., 486 pp. 550 wood-cuts. Vol. II., 8vo., 400 pp., 340 cuts.

VETERINARY MEDICINE.

Clater and Skinner's Farrier, 1 vol. 12mo., 220 pp.
Youatt's Great Work on the Horse, by Skinner, 1 vol. 8vo., 448 pages, many cuts.
Youatt and Clater's Cattle Doctor, 1 vol. 12mo., 282 pages, cuts.
Youatt on the Dog, by Lewis, 1 vol. demy 8vo., 403 pages, beautiful plates.
Youatt on the Pig, 12mo., illustrated.

Other new and important works are in preparation.

Two Medical Periodicals, free of postage, for Five Dollars.

THE AMERICAN JOURNAL OF THE MEDICAL SCIENCES,

EDITED BY ISAAC HAYS, M. D.,

IS PUBLISHED QUARTERLY, ON THE FIRST OF JANUARY, APRIL, JULY, AND OCTOBER,

By BLANCHARD & LEA, Philadelphia.

Each Number contains about Two Hundred and Eighty Large Octavo Pages,
Appropriately Illustrated with Engravings on Copper, Wood, Stone, &c.

THE MEDICAL NEWS AND LIBRARY

Is Published Monthly, and consists of

THIRTY-TWO VERY LARGE OCTAVO PAGES,

Containing the Medical Information of the day, as well as a Treatise of high character on some prominent department of Medicine.

In this manner its subscribers have been supplied with

WATSON'S LECTURES ON THE PRACTICE OF MEDICINE,
BRODIE'S CLINICAL LECTURES ON SURGERY,
TODD & BOWMAN'S PHYSIOLOGY,
WEST ON THE DISEASES OF INFANCY AND CHILDHOOD,
AND MALGAIGNE'S OPERATIVE SURGERY.
SIMON'S LECTURES ON GENERAL PATHOLOGY.

And the work at present appearing in its columns is

TODD & BOWMAN'S PHYSIOLOGY, Part IV. **(See Advertisement, p. 15.)**

TERMS.

THE SUBSCRIPTION TO THE

AMERICAN JOURNAL OF THE MEDICAL SCIENCES

IS FIVE DOLLARS PER ANNUM.

When this amount is paid in advance, the subscriber thereby becomes entitled to the

MEDICAL NEWS AND LIBRARY FOR ONE YEAR, GRATIS.

When ordered separately, the price of the "News" is ONE DOLLAR per annum, invariably in advance.

THE MEDICAL JOURNAL free of Postage.

Under the new Post-Office law of the first of October, 1852, the publishers have the privilege of prepaying the postage on Journals sent by mail to subscribers. They therefore avail themselves of it by offering to pay the postage on the AMERICAN MEDICAL JOURNAL, and MEDICAL NEWS AND LIBRARY sent to advance-paying subscribers.

Gentlemen, therefore, who remit their annual subscriptions for the year in advance, will receive, for the small sum of Five Dollars,

THE AMERICAN JOURNAL OF THE MEDICAL SCIENCES

AND

THE MEDICAL NEWS AND LIBRARY,

Embracing about Fifteen Hundred large octavo pages, mailed to any part of the United States, free of postage.

Those who remit during January and February, will be considered as entitled to the News, and will receive, free of postage, all the numbers of both periodicals which have not been mailed previous to their remittance; the publishers thus agreeing to prepay everything for which they have been paid in advance.

The advantages of a remittance before the opening of any year will thus be apparent.

Address

BLANCHARD & LEA, Philadelphia.

NEW AND ENLARGED EDITION OF

NEILL & SMITH'S COMPENDIUM—(NOW READY.)

AN ANALYTICAL COMPENDIUM

OF THE VARIOUS BRANCHES OF MEDICAL SCIENCE,

FOR THE USE AND EXAMINATION OF STUDENTS.

BY JOHN NEILL, M. D.,

Demonstrator of Anatomy in the University of Pennsylvania; Surgeon to the Pennsylvania Hospital:

AND

FRANCIS GURNEY SMITH, M. D.,

Professor of Institutes of Medicine in the Pennsylvania Medical College, &c.

Second Edition, Revised and Improved.

In one very large and handsomely printed volume, royal 12mo., of over 1000 large pages, with about 350 illustrations, strongly bound in leather, with raised bands.

PREFACE TO THE NEW EDITION.

The speedy sale of a large impression of this work has afforded to the authors gratifying evidence of the correctness of the views which actuated them in its preparation. In meeting the demand for a second edition, they have therefore been desirous to render it more worthy of the favor with which it has been received. To accomplish this, they have spared neither time nor labor in embodying in it such discoveries and improvements as have been made since its first appearance, and such alterations as have been suggested by its practical use in the class and examination-room. Considerable modifications have thus been introduced throughout all the departments treated of in the volume, but more especially in the portion devoted to the "Practice of Medicine," which has been entirely rearranged and rewritten. The authors therefore again submit their work to the profession, with the hope that their efforts may tend, however humbly, to advance the great cause of medical education.

Notwithstanding the increased size and improved execution of this work, the price has not been increased, and it is confidently presented as one of the cheapest volumes now before the profession.

COOPER'S SURGICAL LECTURES—(Just Issued.)

LECTURES ON THE

PRINCIPLES AND PRACTICE OF SURGERY.

BY BRANSBY B. COOPER, F. R. S.,

Senior Surgeon to Guy's Hospital.

In one very large octavo volume, of seven hundred and fifty pages.

For twenty-five years Mr. Bransby Cooper has been surgeon to Guy's Hospital; and the volume before us may be said to consist of an account of the results of his surgical experience during that long period.

We cordially recommend Mr. Bransby Cooper's Lectures as a most valuable addition to our surgical literature, and one which cannot fail to be of service both to students and to those who are actively engaged in the practice of their profession.—*The Lancet.*

A good book by a good man is always welcome; and Mr. Bransby Cooper's book does no discredit to its paternity. It has reminded us, in its easy style and copious detail, more of Watson's Lectures, than any book we have seen lately, and we should not be surprised to see it occupy a similar position to that well-known work in professional estimation. It consists of seventy-five lectures on the most important surgical diseases. To analyze such a work is impossible, while so interesting is every lecture, that we feel ourselves really at a loss what to select for quotation.

The work is one which cannot fail to become a favorite with the profession; and it promises to supply a hiatus which the student of surgery has often to deplore.—*Medical Times.*

MALGAIGNE'S SURGERY.—(Just Published.)

OPERATIVE SURGERY,

BASED ON NORMAL AND PATHOLOGICAL ANATOMY.

BY J. F. MALGAIGNE.

TRANSLATED FROM THE FRENCH,

BY FREDERICK BRITTAN, A. B., M.D., M.R.C.S.L.

WITH NUMEROUS ILLUSTRATIONS ON WOOD.

In one handsome octavo volume of nearly 600 pages.

This work has, during its passage through the columns of the "Medical News and Library" in 1850 and 1851, received the unanimous approbation of the profession, and in presenting it in a complete form the publishers confidently anticipate for it an extended circulation.

Certainly one of the best books published on operative surgery.—*Edinburgh Med. Journal.*

We can strongly recommend it both to practitioners and students, not only as a safe guide in the dissecting-room or operating-theatre, but also as a concise work of reference for all that relates to operative surgery.—*Forbes's Review.*

Dr. Brittan has performed his task of translator and editor with much judgment. The descriptions are perfectly clear and explicit; and the author's occasional omissions of important operations proposed by British surgeons are judiciously supplied in brief notes.—*Medical Gazette.*

GROSS ON URINARY ORGANS—(Lately Issued.)

A PRACTICAL TREATISE ON THE

DISEASES AND INJURIES OF THE URINARY ORGANS.

BY S. D. GROSS, M. D., &c.,

Professor of Surgery in the New York University.

In one large and beautifully printed octavo volume, of over seven hundred pages.

With numerous Illustrations.

The author of this work has devoted several years to its preparation, and has endeavored to render it complete and thorough on all points connected with the important subject to which it is devoted. It contains a large number of original illustrations, presenting the natural and pathological anatomy of the parts under consideration, instruments, modes of operation, &c. &c., and in mechanical execution it is one of the handsomest volumes yet issued from the American press.

Dr. Gross has brought all his learning, experience, tact, and judgment to the task, and has produced a work worthy of his high reputation. We feel perfectly safe in recommending it to our readers as a monograph unequalled in interest and practical value by any other on the subject in our language: and we cannot help saying that we esteem it a matter of just pride, that another work so creditable to our country has been contributed to our medical literature by a Western physician.—*The Western Journal of Medicine and Surgery*

We regret that our limits preclude such a notice as this valuable contribution to our American medical literature merits. We have only room to say that the author deserves the thanks of the profession for this elaborate production: which cannot fail to augment the exalted reputation acquired by his former works, for which he has been honored at home and abroad.—*N. Y. Med. Gazette.*

COOPER ON DISLOCATIONS.—New Edition—(Just Issued.)

A TREATISE ON

DISLOCATIONS AND FRACTURES OF THE JOINTS.

By Sir ASTLEY P. COOPER, Bart., F. R. S., &c.

Edited by BRANSBY B. COOPER, F. R. S., &c.

WITH ADDITIONAL OBSERVATIONS BY PROF. J. C. WARREN.

A NEW AMERICAN EDITION,

In one handsome octavo volume, with numerous illustrations on wood.

After the fiat of the profession, it would be absurd in us to eulogize Sir Astley Cooper's work on Dislocations. It is a national one, and will probably subsist as long as English Surgery.—*Medico-Chirurg. Review.*

WORKS BY THE SAME AUTHOR.

COOPER (SIR ASTLEY) ON THE ANATOMY AND TREATMENT OF ABDOMINAL HERNIA. 1 large vol., imp. 8vo., with over 130 lithographic figures.

COOPER ON THE STRUCTURE AND DISEASES OF THE TESTIS, AND ON THE THYMUS GLAND. 1 vol., imp. 8vo., with 177 figures on 29 plates

COOPER ON THE ANATOMY AND DISEASES OF THE BREAST. WITH TWENTY-FIVE MISCELLANEOUS AND SURGICAL PAPERS. 1 large vol., imp. 8vo., with 252 figures on 30 plates

These three volumes complete the surgical writings of Sir Astley Cooper. They are very handsomely printed, with a large number of lithographic plates, executed in the best style, and are presented at exceedingly low prices.

LISTON & MUTTER'S SURGERY.

LECTURES ON THE OPERATIONS OF SURGERY,

AND ON DISEASES AND ACCIDENTS REQUIRING OPERATIONS.

BY ROBERT LISTON, Esq., F. R. S., &c.

EDITED, WITH NUMEROUS ADDITIONS AND ALTERATIONS,

BY T. D. MÜTTER, M. D.,

Professor of Surgery in the Jefferson Medical College of Philadelphia.

In one large and handsome octavo volume of 566 pages, with 216 wood-cuts.

STANLEY ON THE BONES.—A Treatise on Diseases of the Bones. In one vol. 8vo., extra cloth. 296 pp.

BRODIE'S SURGICAL LECTURES.—Clinical Lectures on Surgery. 1 vol. 8vo. cloth. 350 pp

BRODIE ON THE JOINTS.—Pathological and Surgical Observations on the Diseases of the Joints. 1 vol. 8vo., cloth. 216 pp

BRODIE ON URINARY ORGANS.—Lectures on the Diseases of the Urinary Organs. 1 vol. 8vo. cloth. 214 pp.

*** These three works may be had neatly bound together, forming a large volume of "Brodie's Surgical Works." 780 pp.

RICORD ON VENEREAL.—A Practical Treatise on Venereal Diseases. With a Therapeutical Summary and Special Formulary. Translated by Sidney Donne, M. D. Fourth edition. 1 vol. 8vo. 340 pp

DURLACHER ON CORNS, BUNIONS, &c.—A Treatise on Corns, Bunions, the Diseases of Nails, and the General Management of the Feet. In one 12mo. volume, cloth. 134 pp

GUTHRIE ON THE BLADDER, &c.—The Anatomy of the Bladder and Urethra, and the Treatment of the Obstructions to which those Passages are liable. In one vol. 8vo. 150 pp.

LAWRENCE ON RUPTURES.—A Treatise on Ruptures, from the fifth London Edition. In one 8vo. vol. sheep. 450 pp.

A NEW TEXT-BOOK ON SURGERY—(Now Ready.)

THE PRINCIPLES AND PRACTICE OF SURGERY.

BY WILLIAM PIRRIE, F.R.S.E.,

Regius Professor of Surgery in the University of Aberdeen.

EDITED, BY JOHN NEILL, M.D.,

Demonstrator of Anatomy in the University of Pennsylvania, Lecturer on Anatomy in the Medical Institute of Philadelphia, &c.

In one very handsome octavo volume, of 780 pages, with 316 illustrations.

The object of the author, in the preparation of this volume, has been to present to the student a complete text-book of surgery, embracing both the principles and the practice in their mutual relations, according to the latest state of scientific development. In accomplishing this, his aim has been to combine simplicity of arrangement, and conciseness and clearness of description, with the elucidation of sound principles and the modes of practice which his own experience and the teachings of the best authorities have shown to be the most successful. The Editor has, therefore, found but little to add respecting European surgery, and his efforts consequently have been directed towards introducing such improvements as have been pointed out by the practitioners of the United States, and such further information as may be requisite for the guidance of the student in this country.—Of the very numerous illustrations, the greater portion are from preparations in the author's museum, or from patients under his care. These have been reproduced with great care, and the whole is presented as an original and highly practical work, and at the same time as a handsome specimen of typographical execution.

However well it may be adapted for a text-book (and in this respect it may compete with the best of them) of this much our reading has convinced us, that as a systematic treatise, it is carefully and ably written, and can hardly fail to command a prominent position in the library of practitioners; though not complete in the fullest sense of the word, it nevertheless furnishes the student and practitioner with as chaste and concise a work as exists in our language. The additions to the volume by Dr. Neill, are judicious; and while they render it more complete, greatly enhance its practical value, as a work for practitioners and students.—*N. Y. Journal of Medicine.*

We know of no other surgical book of a reasonable size, wherein there is so much theory and practice, or where subjects are more soundly or clearly taught.—*The Stethoscope.*

Our impression is, that as a manual for students, Pirrie's is the best work extant.—*Western Med. and Surg. Journal.*

LIBRARY OF SURGICAL KNOWLEDGE.

A SYSTEM OF SURGERY.

BY J. M. CHELIUS.

TRANSLATED FROM THE GERMAN,

AND ACCOMPANIED WITH ADDITIONAL NOTES AND REFERENCES,

BY JOHN F. SOUTH.

Complete in three very large octavo volumes of nearly 2200 pages, strongly bound, with raised bands and double titles.

We do not hesitate to pronounce it the best and most comprehensive system of modern surgery with which we are acquainted.—*Medico-Chirurgical Review.*

The fullest and ablest digest extant of all that relates to the present advanced state of Surgical Pathology.—*American Medical Journal.*

If we were confined to a single work on Surgery, that work should be Chelius's.—*St. Louis Med. Journal.*

As complete as any system of Surgery can well be.—*Southern Medical and Surgical Journal.*

The most finished system of Surgery in the English language.—*Western Lancet.*

The most learned and complete systematic treatise now extant.—*Edinburgh Medical Journal.*

No work in the English language comprises so large an amount of information relative to operative medicine and surgical pathology.—*Medical Gazette.*

A complete encyclopedia of surgical science—a very complete surgical library—by far the most complete and scientific system of surgery in the English language.—*N. Y. Journal of Medicine.*

One of the most complete treatises on Surgery in the English language.—*Monthly Journal of Med. Science.*

The most extensive and comprehensive account of the art and science of Surgery in our language.—*Lancet.*

JONES ON THE EYE.

THE PRINCIPLES AND PRACTICE

OF OPHTHALMIC MEDICINE AND SURGERY.

BY T. WHARTON JONES, F.R.S., &c. &c.

EDITED BY ISAAC HAYS, M.D., &c.

In one very neat volume, large royal 12mo. of 529 pages, with four plates, plain or colored, and ninety-eight well executed wood-cuts.

MAURY'S DENTAL SURGERY.—A Treatise on the Dental Art, founded on Actual Experience. Illustrated by 241 lithographic figures and 54 wood-cuts. Translated by J. B. Savier. In 1 8vo. vol., sheep. 266 pp.

DUFTON ON THE EAR.—The Nature and Treatment of Deafness and Diseases of the Ear; and the Treatment of the Deaf and Dumb. One small 12mo. volume. 120 pp.

SMITH ON FRACTURES.—A Treatise on Fractures in the vicinity of Joints, and on Dislocations. One vol. 8vo., with 200 beautiful wood-cuts.

NEW AND MUCH IMPROVED EDITION—(Now Ready.)

A SYSTEM OF PRACTICAL SURGERY.

BY WILLIAM FERGUSSON, F. R. S.,

Professor of Surgery in King's College, London. &c. &c.

FOURTH AMERICAN, FROM THE THIRD AND ENLARGED LONDON EDITION.

In one large and beautifully printed octavo volume of about seven hundred pages, with three hundred and ninety-three wood engravings.

The present edition of this favorite work will be found far superior to its predecessors, the author having used every exertion, not only to bring it thoroughly up to the day with all the most recent observations and improvements, but also to supply by additional chapters, whatever deficiencies may have formerly existed. To avoid increasing unduly the bulk of the volume, while accommodating these additions, and the large number of new and beautiful illustrations, the size of the page has been increased, and the work is still kept at its former very moderate price, notwithstanding a marked improvement in its mechanical execution, which renders it one of the handsomest volumes as yet presented.

The most important subjects in connection with practical surgery which have been more recently brought under the notice of, and discussed by, the surgeons of Great Britain, are fully and dispassionately considered by Mr. Fergusson, and that which was before wanting has now been supplied, so that we can now look upon it as a work on practical surgery instead of one on operative surgery alone, which many have hitherto considered it to be. And we think the author has shown a wise discretion in making the additions on surgical disease which are to be found in the present volume, and has very much enhanced its value: for, besides two excellent chapters on the diseases of bones and joints, which were wanting before, he has headed each chief section of the work by a general description of the surgical disease and injury of that region of the body which is treated of in each, prior to entering into the consideration of the more special morbid conditions and their treatment. There is also, as in former editions, a sketch of the anatomy of particular regions.

We have now pointed out some of the principal additions in this work. There was some ground formerly for the complaint before alluded to, that it dwelt too exclusively on operative surgery; but this defect is now removed, and the book is more than ever adapted for the purposes of the practitioner, whether he confines himself more strictly to the operative department, or follows surgery on a more comprehensive scale.—*Medical Times and Gazette.*

NEW AND IMPORTANT WORK ON PRACTICAL SURGERY.—(JUST ISSUED.)

OPERATIVE SURGERY.

BY FREDERICK C. SKEY, F. R. S., &c.

In one very handsome octavo volume of over 650 pages, with about one hundred wood-cuts.

The treatise is, indeed, one on operative surgery, but it is one in which the author throughout shows that he is most anxious to place operative surgery in its just position. He has acted as a judicious, but not partial friend; and while he shows throughout that he is able and ready to perform any operation which the exigencies and casualties of the human frame may require, he is most cautious in specifying the circumstances which in each case indicate and contraindicate operation. It is indeed gratifying to perceive the sound and correct views which Mr. Skey entertains on the subject of operations in general, and the gentlemanly tone in which he impresses on readers the lessons which he is desirous to inculcate. His work is a perfect model for the operating surgeon, who will learn from it not only when and how to operate, but some more noble and exalted lessons which cannot fail to improve him as a moral and social agent.—*Edinburgh Medical and Surgical Journal.*

THE STUDENT'S TEXT-BOOK.

THE PRINCIPLES AND PRACTICE OF MODERN SURGERY.

BY ROBERT DRUITT, Fellow of the Royal College of Surgeons.

A New American, from the last and improved London Edition.

EDITED BY F. W. SARGENT, M. D., Author of "Minor Surgery," &c.

ILLUSTRATED WITH ONE HUNDRED AND NINETY-THREE WOOD ENGRAVINGS.

In one very handsomely printed octavo volume of 576 large pages.

From Professor Brainard, of Chicago, Illinois.

I think it the best work of its size, on that subject, in the language.

From Professor Rivers, of Providence, Rhode Island.

I have been acquainted with it since its first republication in this country, and the universal praise it has received I think well merited.

From Professor May, of Washington, D. C.

Permit me to express my satisfaction at the republication in so improved a form of this most valuable work. I believe it to be one of the very best text-books ever issued.

From Professor McCook, of Baltimore.

I cannot withhold my approval of its merits, or the expression that no work is better suited to the wants of the student. I shall commend it to my class, and make it my chief text-book.

A NEW MINOR SURGERY.

ON BANDAGING AND OTHER POINTS OF MINOR SURGERY.

BY F. W. SARGENT, M. D.

In one handsome royal 12mo. volume of nearly 400 pages, with 128 wood-cuts.

From Professor Gilbert, Philadelphia.

Embracing the smaller details of surgery, which are illustrated by very accurate engravings, the work becomes one of very great importance to the practitioner in the performance of his daily duties, since such information is rarely found in the general works on surgery now in use.

The great Atlas of Surgical Anatomy--(Now Complete.)

SURGICAL ANATOMY.

BY JOSEPH MACLISE, SURGEON.

IN ONE VOLUME, VERY LARGE IMPERIAL QUARTO,

With Sixty-eight large and splendid Plates, drawn in the best style, and beautifully colored,

Containing one hundred and ninety Figures, many of them the size of life.

TOGETHER WITH COPIOUS EXPLANATORY LETTER-PRESS.

Strongly and handsomely bound in extra cloth, being one of the best executed and cheapest surgical works as yet issued in the country.

This great work being now concluded, the publishers confidently present it to the attention of the profession as worthy in every respect of their approbation and patronage. No complete work of the kind has yet been published in the English language, and it therefore will supply a want long felt in this country of an accurate and comprehensive Atlas of Surgical Anatomy to which the student and practitioner can at all times refer, to ascertain the exact relative position of the various portions of the human frame towards each other and to the surface, as well as their abnormal deviations. The importance of such a work to the student in the absence of anatomical material, and to the practitioner when about attempting an operation, is evident, while the price of the book, notwithstanding the large size, beauty, and finish of the very numerous illustrations, is so low as to place it within the reach of every member of the profession. The publishers therefore confidently anticipate a very extended circulation for this magnificent work.

Notwithstanding the short time in which this work has been before the profession, it has received the unanimous approbation of all who have examined it. From among a very large number of commendatory notices with which they have been favored, the publishers select the following:—

From Prof. D. Gilbert, Philadelphia.

Allow me to say, gentlemen, that the thanks of the profession at large, in this country are due to you for the republication of this admirable work of Maclise. The precise relationship of the organs in the regions displayed is so perfect, that even those who have daily access to the dissecting-room may, by consulting this work, enliven and confirm their anatomical knowledge prior to an operation. But it is to the thousands of practitioners of our country who cannot enjoy these advantages that the perusal of those plates, with their concise and accurate descriptions, will prove of infinite value. These have supplied a desideratum, which will enable them to refresh their knowledge of the important structures involved in their surgical cases, thus establishing their self-confidence, and enabling them to undertake operative procedures with every assurance of success. And as all the practical departments in medicine rest upon the same basis, and are enriched from the same sources, I need hardly add that this work should be found in the library of every practitioner in the land.

From Prof. Gibson, Richmond, Va.

Excellent as are the previous numbers, the present one far surpasses them, and indeed is superior to anything of the kind I have ever seen. The plates illustrating the anatomy of the Urethra and Bladder are superb.

From Prof. McClintock, Philadelphia.

I regard it as the best book on the subject ever published in this country. I have recommended it to the gentlemen of our classes, many of whom, after procuring it, have thanked me for the advice.

From Prof. Bethune, Trinity College, Toronto.

The work is exceedingly well brought out, and reflects the highest credit upon your establishment. It will afford me great pleasure to recommend it to all my professional friends and pupils.

From Prof. Kimball, Pittsfield, Mass.

I have examined these numbers with the greatest satisfaction, and feel bound to say that they are altogether the most perfect and satisfactory plates of the kind that I have ever seen.

From Prof. Richardson, University of Toronto.

No commendation is necessary from me to secure for it a wide circulation, for it has obtained, both in Britain and America, the most marked approbation; and upon examination it will commend itself to all for the clearness, fidelity, and beauty of the plates, and the able descriptions of the letter-press.

From Prof. Brainard, Chicago, Ill.

The work is extremely well adapted to the use both of students and practitioners, being sufficiently extensive for practical purposes, without being so expensive as to place it beyond their reach. Such a work was a desideratum in this country, and I shall not fail to recommend it to those within the sphere of my acquaintance.

From Prof. P. F. Eve, Augusta, Ga.

I consider this work a great acquisition to my library, and shall take pleasure in recommending it on all suitable occasions.

From Prof. Peaslee, Brunswick, Me.

The second part more than fulfils the promise held out by the first, so far as the beauty of the illustrations is concerned; and, respecting my opinion of the value of the work, so far as it has advanced, I need add nothing to what I have previously expressed to you.

From Prof. Gunn, Ann Arbor, Mich.

The plates in your edition of Maclise answer, in an eminent degree, the purpose for which they are intended. I shall take pleasure in exhibiting it and recommending it to my class.

From Prof. Rivers, Providence, R. I.

The plates illustrative of Hernia are the most satisfactory I have ever met with.

From Prof. S. D. Gross, Louisville, Ky.

The work, as far as it has progressed, is most admirable, and cannot fail, when completed, to form a most valuable contribution to the literature of our profession. It will afford me great pleasure to recommend it to the pupils of the University of Louisville.

Maclise's Surgical Anatomy—(Continued.)

From Prof. R. L. Howard, Columbus Ohio.

In all respects, the first number is the beginning of a most excellent work, filling completely what might be considered hitherto a vacuum in surgical literature. For myself, in behalf of the medical profession, I wish to express to you my thanks for this truly elegant and meritorious work. I am confident that it will meet with a ready and extensive sale. I have spoken of it in the highest terms to my class and my professional brethren.

From Prof. Granville S. Pattison, N. Y.

The profession, in my opinion, owe you many thanks for the publication of this beautiful work—a work which, in the correctness of its exhibitions of Surgical Anatomy, is not surpassed by any with which I am acquainted; and the admirable manner in which the lithographic plates have been executed and colored is alike honorable to your house and to the arts in the United States.

From Prof. J. F. May, Washington, D. C.

Having examined the work I am pleased to add my testimony to its correctness, and to its value as a work of reference by the surgeon.

From Prof. Alden Marsh, Albany, N. Y.

From what I have seen of it, I think the design and execution of the work admirable, and, at the proper time in my course of lectures, I shall exhibit it to the class, and give it a recommendation worthy of its great merit.

From H. H. Smith, M. D., Philadelphia.

Permit me to express my gratification at the execution of Maclise's Surgical Anatomy. The plates are, in my opinion, the best lithographs that I have seen of a medical character, and the coloring of this number cannot, I think, be improved. Estimating highly the contents of the work. I shall continue to recommend it to my class as I have heretofore done.

From Prof. J. M. Bush, Lexington, Ky.

I am delighted with both the plan and execution of the work, and shall take all occasions to recommend it to my private pupils and public classes.

This is by far the ablest work on Surgical Anatomy that has come under our observation. We know of no other work that would justify a student, in any degree, for neglect of actual dissection. A careful study of these plates, and of the commentaries on them, would almost make an anatomist of a diligent student. And to one who has studied anatomy by dissection, this work is invaluable as a perpetual remembrancer, in matters of knowledge that may slip from the memory. The practitioner can scarcely consider himself equipped for the duties of his profession without such a work as this, and this has no rival, in his library. In those sudden emergencies that so often arise, and which require the instantaneous command of minute anatomical knowledge, a work of this kind keeps the details of the dissecting-room perpetually fresh in the memory. We appeal to our readers, whether any one can justifiably undertake the practice of medicine who is not prepared to give all needful assistance, in all matters demanding immediate relief. We repeat that no medical library, however large, can be complete without Maclise's Surgical Anatomy. The American edition is well entitled to the confidence of the profession, and should command, among them, an extensive sale. The investment of the amount of the cost of this work will prove to be a very profitable one, and if practitioners would qualify themselves thoroughly with such important knowledge as is contained in works of this kind, there would be fewer of them sighing for employment. The medical profession should spring towards such an opportunity as is presented in this republication, to encourage frequent repetitions of American enterprise of this kind.—*The Western Journal of Medicine and Surgery.*

One of the greatest artistic triumphs of the age in Surgical Anatomy.—*British American Medical Journal.*

One of the most useful and elegant practical works on anatomy ever published.—*London Lancet.*

Too much cannot be said in its praise; indeed, we have not language to do it justice.—*Ohio Medical and Surgical Journal.*

The most admirable surgical atlas we have seen. To the practitioner deprived of demonstrative dissections upon the human subject, it is an invaluable companion.—*N. J. Medical Reporter.*

The most accurately engraved and beautifully colored plates we have ever seen in an American book—one of the best and cheapest surgical works ever published.—*Buffalo Medical Journal.*

It is very rare that so elegantly printed, so well illustrated, and so useful a work, is offered at so moderate a price.—*Charleston Medical Journal.*

Its plates can boast a superiority which places them almost beyond the reach of competition.—*Medical Examiner.*

Every practitioner, we think, should have a work of this kind within reach.—*Southern Medical and Surgical Journal.*

No such lithographic illustrations of surgical regions have hitherto, we think, been given.—*Boston Medical and Surgical Journal.*

As a surgical anatomist, Mr. Maclise has probably no superior.—*British and Foreign Medico-Chirurgical Review.*

Of great value to the student engaged in dissecting, and to the surgeon at a distance from the means of keeping up his anatomical knowledge.—*Medical Times.*

All that can be desired or expected.—*American Medical Journal.*

The mechanical execution cannot be excelled.—*Transylvania Medical Journal.*

A work which has no parallel in point of accuracy and cheapness in the English language.—*N. Y. Journal of Medicine.*

To all engaged in the study or practice of their profession, such a work is almost indispensable.—*Dublin Quarterly Medical Journal.*

No practitioner whose means will admit should fail to possess it.—*Ranking's Abstract.*

Country practitioners will find these plates of immense value.—*N. Y. Medical Gazette.*

We are extremely gratified to announce to the profession the completion of this truly magnificent work, which, as a whole, certainly stands unrivalled, both for accuracy of drawing, beauty of coloring, and all the requisite explanations of the subject in hand. To the publishers, the profession in America is deeply indebted for placing such a valuable, such a useful work, at its disposal, and at such a moderate price. It is one of the most finished and complete pictures of Surgical Anatomy ever offered to the profession of America. With these plates before them, the student and practitioner can never be at a loss, under the most desperate circumstances. We do not intend these for commonplace compliments. We are sincere: because we know the work will be found invaluable to the young, no less than the old, surgeon. We have not space to point out its beauties, and its merits; but we speak of it *en masse*, as a whole, and strongly urge—especially those, who, from their position, may be debarred the privilege and opportunity of inspecting the fresh subject, to furnish themselves with the entire work.—*The New Orleans Medical and Surgical Journal.*

NEW AND ENLARGED EDITION, MUCH IMPROVED.

PRINCIPLES OF SURGERY.

BY JAMES MILLER, F. R. S. E.,

Professor of Surgery in the University of Edinburgh.

Third American, from the Second and Revised Edinburgh Edition.

REVISED, WITH ADDITIONS, BY F. W. SARGENT, M. D.,

Author of "Minor Surgery," &c.

In one large and very beautiful octavo volume, of seven hundred and fifty-two pages,

WITH TWO HUNDRED AND FORTY EXQUISITE ILLUSTRATIONS ON WOOD.

The publishers have endeavored to render the present edition of this work, in every point of mechanical execution, worthy of its very high reputation, and they confidently present it to the profession as one of the handsomest volumes as yet issued in this country.

This edition is far superior, both in the abundance and quality of its material, to any of the preceding. We hope it will be extensively read, and the sound principles which are herein taught treasured up for future application. The work takes rank with Watson's Practice of Physic; it certainly does not fall behind that great work in soundness of principle or depth of reasoning and research. No physician who values his reputation, or seeks the interests of his clients, can acquit himself before his God and the world without making himself familiar with the sound and philosophical views developed in the foregoing book.—*New Orleans Medical and Surgical Journal.*

Without doubt the ablest exposition of the principles of that branch of the healing art in any language. This opinion, deliberately formed after a careful study of the first edition, we have had no cause to change on examining the second. This edition has undergone thorough revision by the author; many expressions have been modified, and a mass of new matter introduced. The book is got up in the finest style, and is an evidence of the progress of typography in our country.—*Charleston Medical Journal and Review.*

We recommend it to both student and practitioner, feeling assured that as it now comes to us, it presents the most satisfactory exposition of the modern doctrines of the principles of surgery to be found in any volume in any language.—*N. Y. Journal of Medicine.*

BY THE SAME AUTHOR.

THE PRACTICE OF SURGERY.

In one octavo volume, of 496 pages.

NEW AND MUCH IMPROVED EDITION—(Nearly Ready.)

LAWRENCE'S GREAT WORK ON THE EYE.

A TREATISE ON DISEASES OF THE EYE.

BY W. LAWRENCE, F. R. S.

Third American Edition, greatly enlarged, with over 200 Illustrations.

BY ISAAC HAYS, M. D.

Surgeon to Wills Hospital, Philadelphia, &c.

In one very large and handsome octavo volume.

This work, by far the largest and most comprehensive on the subject within reach of the profession in this country, will receive an entire revision on the part of the editor. Brought up in this manner to the most advanced state of science, and presenting an equal improvement over its predecessors as regards mechanical execution, it is confidently presented as worthy of the extended reputation which it has hitherto enjoyed.

A NEW WORK ON THE EAR—(Just Ready.)

A PRACTICAL TREATISE ON THE DISEASES OF THE EAR.

BY W. R. WILDE,

Surgeon to St. Mark's Ophthalmic and Aural Hospital, Dublin.

In one handsome royal 12mo. volume, with illustrations.

So little is generally known in this country concerning the causes, symptoms, and treatment of aural affections, that a practical and scientific work on that subject, from a practitioner of Mr. Wilde's great experience, cannot fail to be productive of much benefit, by attracting attention to this obscure class of diseases, which too frequently escape attention until past relief. The immense number of cases which have come under Mr. Wilde's observation for many years, have afforded him opportunities rarely enjoyed for investigating this branch of medical science, and his work may therefore be regarded as of the highest authority.

SHARPEY AND QUAIN'S ANATOMY.—(Lately Issued.)

HUMAN ANATOMY.

BY JONES QUAIN, M. D.

FROM THE FIFTH LONDON EDITION.

EDITED BY

RICHARD QUAIN, F. R. S., AND WILLIAM SHARPEY, M. D., F. R. S.,

Professors of Anatomy and Physiology in University College, London.

REVISED, WITH NOTES AND ADDITIONS,

BY JOSEPH LEIDY, M. D.

Complete in Two large Octave Volumes, of about Thirteen Hundred Pages.

Beautifully Illustrated with over Five Hundred Engravings on Wood.

We have here one of the best expositions of the present state of anatomical science extant. There is not probably a work to be found in the English language which contains so complete an account of the progress and present state of general and special anatomy as this. By the anatomist this work must be eagerly sought for, and no student's library can be complete without it.—*The N. Y. Journal of Medicine.*

We know of no work which we would sooner see in the hands of every student of this branch of medical science than Sharpey and Quain's Anatomy.—*The Western Journal of Medicine and Surgery.*

It may now be regarded as the most complete and best posted up work on anatomy in the language. It will be found particularly rich in general anatomy.—*The Charleston Medical Journal.*

We believe we express the opinion of all who have examined these volumes, that there is no work superior to them on the subject which they so ably describe.—*Southern Medical and Surgical Journal.*

It is one of the most comprehensive and best works upon anatomy in the English language. It is equally valuable to the teacher, practitioner, and student in medicine, and to the surgeon in particular.—*The Ohio Medical and Surgical Journal.*

To those who wish an extensive treatise on Anatomy, we recommend these handsome volumes as the best that have ever issued from the English or American Press.—*The N. W. Medical and Surgical Journal.*

We believe that any country might safely be challenged to produce a treatise on anatomy so readable, so clear, and so full upon all-important topics.—*British and Foreign Medico-Chirurgical Review.*

It is indeed a work calculated to make an era in anatomical study, by placing before the student every department of his science, with a view to the relative importance of each; and so skillfully have the different parts been interwoven, that no one who makes this work the basis of his studies will hereafter have any excuse for neglecting or undervaluing any important particulars connected with the structure of the human frame; and whether the bias of his mind lead him in a more especial manner to surgery, physic, or physiology, he will find here a work at once so comprehensive and practical as to defend him from exclusiveness on the one hand, and pedantry on the other.—*Monthly Journal and Retrospect of the Medical Sciences.*

We have no hesitation in recommending this treatise on anatomy as the most complete on that subject in the English language; and the only one, perhaps, in any language, which brings the state of knowledge forward to the most recent discoveries.—*The Edinburgh Medical and Surgical Journal.*

Admirably calculated to fulfil the object for which it is intended.—*Provincial Medical Journal.*

The most complete Treatise on Anatomy in the English language.—*Edinburgh Medical Journal.*

There is no work in the English language to be preferred to Dr. Quain's Elements of Anatomy.—*London Journal of Medicine.*

THE STUDENT'S TEXT-BOOK OF ANATOMY.

NEW AND IMPROVED EDITION—(JUST ISSUED.)

A SYSTEM OF HUMAN ANATOMY,

GENERAL AND SPECIAL.

BY ERASMUS WILSON, M. D.

FOURTH AMERICAN FROM THE LAST ENGLISH EDITION.

EDITED BY PAUL B. GODDARD, A. M., M. D.

WITH TWO HUNDRED AND FIFTY ILLUSTRATIONS.

Beautifully printed, in one large octavo volume of nearly six hundred pages.

In many, if not all the Colleges of the Union, it has become a standard text-book. This, of itself, is sufficiently expressive of its value. A work very desirable to the student; one, the possession of which will greatly facilitate his progress in the study of Practical Anatomy.—*New York Journal of Medicine.*

Its author ranks with the highest on Anatomy.—*Southern Medical and Surgical Journal.*

It offers to the student all the assistance that can be expected from such a work.—*Medical Examiner.*

The most complete and convenient manual for the student we possess.—*American Journal of Med. Sciences.*

In every respect this work, as an anatomical guide for the student and practitioner, merits our warmest and most decided praise.—*London Medical Gazette.*

CARPENTER'S COMPARATIVE PHYSIOLOGY.

PRINCIPLES OF PHYSIOLOGY,

GENERAL AND COMPARATIVE.

BY WILLIAM B. CARPENTER, M. D.,

NEW AND IMPROVED EDITION.—(PREPARING.)

In one very handsome octavo volume, with several hundred beautiful wood-cuts.

A truly magnificent work. In itself a perfect physiological study.—*Ranking's Abstract.*

HORNER'S ANATOMY.

***MUCH IMPROVED AND ENLARGED EDITION.*—(*Just Issued.*)**

SPECIAL ANATOMY AND HISTOLOGY.

BY WILLIAM E. HORNER, M. D.,

Professor of Anatomy in the University of Pennsylvania, &c.

EIGHTH EDITION.

EXTENSIVELY REVISED AND MODIFIED TO 1851.

In two large octavo volumes, handsomely printed, with several hundred illustrations.

This work has enjoyed a thorough and laborious revision on the part of the author, with the view of bringing it fully up to the existing state of knowledge on the subject of general and special anatomy. To adapt it more perfectly to the wants of the student, he has introduced a large number of additional wood-engravings, illustrative of the objects described, while the publishers have endeavored to render the mechanical execution of the work worthy of the extended reputation which it has acquired. The demand which has carried it to an EIGHTH EDITION is a sufficient evidence of the value of the work, and of its adaptation to the wants of the student and professional reader.

NEW AND CHEAPER EDITION.

AN ANATOMICAL ATLAS,

ILLUSTRATIVE OF THE STRUCTURE OF THE HUMAN BODY.

BY HENRY H. SMITH, M. D., &c.

UNDER THE SUPERVISION OF

WILLIAM E. HORNER, M. D.,

Professor of Anatomy in the University of Pennsylvania.

In one volume, large imperial octavo, with about six hundred and fifty beautiful figures.

With the view of extending the sale of this beautifully executed and complete "Anatomical Atlas," the publishers have prepared a new edition, printed on both sides of the page, thus materialy reducing its cost, and enabling them to present it at a price about forty per cent. lower than former editions, while, at the same time, the execution of each plate is in no respect deteriorated, and not a single figure isomitted.

These figures are well selected, and present a complete and accurate representaion of that wonderful fabric, the human body. The plan of this Atlas, which renders it so peculiarly convenient for the student, and its superb artistical execution, have been already pointed out. We must congratulatethe student upon the completion of this Atlas, as it is the most convenient work of the kind that has yet appeared; and we must add, the very beautiful manner in which it is "got up" is so creditable to the country as to be flattering to our national pride.—*American Medical Journal.*

TODD & BOWMAN'S PHYSIOLOGY.

THE PHYSIOLOGICAL ANATOMY

AND PHYSIOLOGY OF MAN.

BY R. B. TODD AND W. BOWMAN.

Parts I. II. and III., in 1 vol. 8vo. of 552 pages, with 153 wood cuts.

The distinguishing peculiarity of this work is, that the authors investigae for themselves every fact asserted; and it is the immense labor consequent upon the vast number of observations requisite to carry out this plan, which has so long delayed the appearanceof its completion. Part IV., with numerous original illustrations, is now appearing in the Medcal News and Library for 1853. Those who have subscribed since the appearance of the preceding portion of the work can obtain it by mail, on remittance of $2 50 to the publishers.

WILSON'S DISSECTOR, New Edition—(Just Issued.)

THE DISSECTOR;

OR, PRACTICAL AND SURGICAL ANATOMY.

BY ERASMUS WILSON.

MODIFIED AND RE-ARRANGED BY

PAUL BECK GODDARD, M. D.

A NEW EDITION, WITH REVISIONS AND ADDITIONS.

In one large and handsome volume, royal 12mo., with one hundred and fifteen illustrations.

In passing this work again through the press, the editor has made such additions and improvements as the advance of anatomical knowledge has rendered necessary to maintain the work in the high reputation which it has acquired in the schools of the United States as a complete and faithful guide to the student of practical anatomy. A number of new illustrations have been added, especially in the portion relating to the complicated anatomy of Hernia. In mechanical execution the work will be found superior to former editions.

WORKS BY W. B. CARPENTER, M. D.

NEW AND ENLARGED EDITION—(Now Ready.)

PRINCIPLES OF HUMAN PHYSIOLOGY;

WITH THEIR CHIEF APPLICATIONS TO

PSYCHOLOGY, PATHOLOGY, THERAPEUTICS, HYGIENE, AND FORENSIC MEDICINE.

Fifth American, from the Fourth and Enlarged London Edition.

WITH THREE HUNDRED AND FOURTEEN ILLUSTRATIONS.

EDITED, WITH ADDITIONS, BY FRANCIS GURNEY SMITH, M. D.,
Professor of the Institutes of Medicine in the Pennsylvania Medical College, &c.

In one very Large and beautiful octavo volume, of nearly eleven hundred pages, handsomely printed, and strongly bound in leather, with raised bands.

From the Author's Preface to the present Edition.

"When the author, on the completion of his 'Principles of General and Comparative Physiology,' applied himself to the preparation of his 'Principles of Human Physiology,' for the press, he found that nothing short of *an entire remodelling* of the preceding edition would in any degree satisfy his notions of what such a treatise ought to be. For although no fundamental change had taken place during the interval in the fabric of Physiological Science, yet a large number of less important modifications had been effected, which had combined to produce a very considerable alteration in its aspect. Moreover, the progressive maturation of his own views, and his increased experience as a teacher, had not only rendered him more keenly alive to the imperfections which were inherent in its original plan, but had caused him to look upon many topics in a light very different from that under which he had previously regarded them; and, in particular, he felt a strong desire to give to his work as *practical* a character as possible, without foregoing the position which (he trusts he may say without presumption) he had succeeded in gaining for it, as a *philosophical* exposition of one important department of Physiological Science. He was led, therefore, to the determination of, in reality, producing *a new treatise*, in which only those parts of the old should be retained, which might express the existing state of knowledge, and of his own opinions, on the points to which they relate."

The American edition has been printed from sheets prepared for the purpose by the author, who has introduced nearly one hundred illustrations not in the London edition; while it has also enjoyed the advantage of a careful superintendence on the part of the editor, who has added notices of such more recent investigations as had escaped the author's attention. Neither care nor expense has been spared in the mechanical execution of the work to render it superior to former editions, and it is confidently presented as in every way one of the handsomest volumes as yet placed before the medical profession in this country.

CARPENTER'S MANUAL OF PHYSIOLOGY.

NEW AND IMPROVED EDITION—(JUST ISSUED.)

ELEMENTS OF PHYSIOLOGY,

INCLUDING PHYSIOLOGICAL ANATOMY.

SECOND AMERICAN, FROM A NEW AND REVISED LONDON EDITION.

With One Hundred and Ninety Illustrations. In one very handsome octavo volume.

In publishing the first edition of this work, its title was altered from that of the London volume by the substitution of the word "Elements" for that of "Manual," and, with the author's sanction, the title of "Elements" is still retained, as being more expressive of the scope of the treatise. A comparison of the present edition with the former one will show a material improvement, the author having revised it thoroughly, with the view of rendering it completely on a level with the most advanced state of the science. By condensing the less important portions, these numerous additions have been introduced without materially increasing the bulk of the volume, and while numerous illustrations have been added, and the general execution of the work improved, it has been kept at its former very moderate price.

To say that it is the best manual of Physiology now before the public, would not do sufficient justice to the author.—*Buffalo Med. Journal.*

In his former works it would seem that he had exhausted the subject of Physiology. In the present, he gives the essence, as it were, of the whole.—*N. Y. Journal of Medicine.*

The best and most complete exposé of modern physiology, in one volume, extant in the English language.—*St. Louis Med. Journal.*

Those who have occasion for an elementary treatise on physiology, cannot do better than to possess themselves of the manual of Dr. Carpenter.—*Medical Examiner.*

DUNGLISON'S PHYSIOLOGY.

New and much Improved Edition.—(Just Issued.)

HUMAN PHYSIOLOGY.

BY ROBLEY DUNGLISON, M. D.,

Professor of the Institutes of Medicine in the Jefferson Medical College, Philadelphia, etc. etc.

SEVENTH EDITION.

Thoroughly revised and extensively modified and enlarged,

With nearly Five Hundred Illustrations.

In two large and handsomely printed octavo volumes, containing nearly 1450 pages.

On no previous revision of this work has the author bestowed more care than on the present, it having been subjected to an entire scrutiny, not only as regards the important matters of which it treats, but also the language in which they are conveyed; and on no former occasion has he felt as satisfied with his endeavors to have the work on a level with the existing state of the science. Perhaps at no time in the history of physiology have observers been more numerous, energetic, and discriminating than within the last few years. Many modifications of fact and inference have consequently taken place, which it has been necessary for the author to record, and to express his views in relation thereto. On the whole subject of physiology proper, as it applies to the functions executed by the different organs, the present edition, the author flatters himself, will therefore be found to contain the views of the most distinguished physiologists of all periods.

The amount of additional matter contained in this edition may be estimated from the fact that the mere list of authors referred to in its preparation alone extends over nine large and closely printed pages. The number of illustrations has been largely increased, the present edition containing four hundred and seventy-four, while the last had but three hundred and sixty-eight; while, in addition to this, many new and superior wood-cuts have been substituted for those which were not deemed sufficiently accurate or satisfactory. The mechanical execution of the work has also been improved in every respect, and the whole is confidently presented as worthy the great and continued favor which it has so long received from the profession.

NEW AND IMPROVED EDITION—(Now Ready.)

A MANUAL OF PHYSIOLOGY,

BY WILLIAM SENHOUSE KIRKES, M. D.,

Demonstrator of Morbid Anatomy at St. Bartholomew's Hospital.

ASSISTED BY JAMES PAGET, F. R. S.,

Lecturer on General Anatomy and Physiology at St. Bartholomew's Hospital.

Second American, from the Second London Edition.

WITH ONE HUNDRED AND SIXTY-FIVE ILLUSTRATIONS.

In one large and handsome royal 12mo. volume, strongly bound.

The new London edition of this work having been thoroughly brought up to the present state of physiological knowledge, little remained to be done in preparing the present volume. An occasional note has, however, been added, and a number of new illustrations have been introduced, wherever the subject appeared to require them. Care has, however, been exercised to maintain the character which the work has acquired of a clear and intelligible manual for students, unincumbered with unnecessary minutiæ and details.

An excellent work, and for students one of the best within reach.—*Boston Medical and Surgical Journal.*
One of the best little books on Physiology which we possess.—*Braithwaite's Retrospect.*
Particularly adapted to those who desire to possess a concise digest of the facts of Human Physiology.—*British and Foreign Med.-Chirurg. Review.*
One of the best treatises which can be put into the hands of the student.—*London Medical Gazette.*
We conscientiously recommend it as an admirable "Handbook of Physiology."—*London Jour. of Medicine.*

HARRISON ON THE NERVES.—An Essay towards a correct theory of the Nervous System. In one octavo volume, 292 pages.

MATTEUCCI ON LIVING BEINGS.—Lectures on the Physical Phenomena of Living Beings. Edited by Pereira. In one neat royal 12mo. volume, extra cloth, with cuts—386 pages.

ROGET'S PHYSIOLOGY.—A Treatise on Animal and Vegetable Physiology, with over 400 illustrations on wood. In two octavo volumes, cloth.

ROGET'S OUTLINES.—Outlines of Physiology and Phrenology. In one octavo volume, cloth—516 pages.

ON THE CONNECTION BETWEEN PHYSIOLOGY AND INTELLECTUAL SCIENCE. In one 12mo. volume, paper, price 25 cents.

SOLLY ON THE BRAIN.—The Human Brain; its Structure, Physiology, and Diseases. In one handsome octavo volume, with over one hundred illustrations.

NOW READY.

AN ATLAS OF PATHOLOGICAL HISTOLOGY.

BY GOTTLIEB GLUGE, M. D.,

Professor of Physiology and Pathological Anatomy in the University of Brussels.

TRANSLATED, WITH NOTES AND ADDITIONS, BY JOSEPH LEIDY, M. D.

In one volume, very large imperial quarto,

WITH THREE HUNDRED AND TWENTY FIGURES, PLAIN AND COLORED, ON TWELVE PLATES.

From the Translator's Preface.

No apology can be necessary for presenting to the medical profession in the United States the translation of a work upon a subject relatively so new to the science of medicine as pathological histology. Its importance to pathological anatomy is of the same character as normal histology is to normal anatomy, and this cannot be better represented than by referring to the great and permanent advance which physiology has made in its relation to the physical structure of the organs of the living body. Pathological anatomy also is beyond doubt of the highest value in medicine, for a scientific treatment of disease must of necessity depend to a very considerable extent upon our knowledge of material changes which are so frequently the source of those symptoms which indicate its existence.

The present volume of Gluge, originally appended to his great work on pathological anatomy, besides illustrating the various subjects of pathological histology, accompanied by copious references, will be found of particular interest from the light which is thrown upon the inflammatory process and its various attendant and accessory phenomena.

WILLIAMS' PRINCIPLES—New and Enlarged Edition.

PRINCIPLES OF MEDICINE,

Comprising General Pathology and Therapeutics, and a brief general view of Etiology, Nosology, Semeiology, Diagnosis, Prognosis, and Hygienics. By Charles J. B. Williams, M.D., F.R.S. Edited, with Additions, by Meredith Clymer, M.D. Third American, from the second and enlarged London edition. In one octavo volume, of 440 pages.

SIMON'S PATHOLOGY—(Now Ready.)

GENERAL PATHOLOGY,

As conducive to The Establishment of Rational Principles for the Diagnosis and Treatment of Disease; a Course of Lectures, delivered at St. Thomas's Hospital, during the summer session of 1850. By John Simon, F. R. S., one of the Surgical Staff of that Hospital, and Officer of Health to the City of London. In one neat octavo volume, extra cloth.

MANUALS ON THE BLOOD AND URINE,

In one handsome volume royal 12mo., extra cloth, of 460 large pages, with numerous illustrations,

CONTAINING

I. A Practical Manual on the Blood and Secretions of the Human Body. BY JOHN WILLIAM GRIFFITH, M. D., &c.

II. On the Analysis of the Blood and Urine in health and disease, and on the treatment of Urinary diseases. BY G. OWEN REESE, M. D., F. R. S., &c. &c.

III. A Guide to the Examination of the Urine in health and disease. BY ALFRED MARKWICK.

NEW EDITION—(JUST ISSUED.)

URINARY DEPOSITS;

THEIR DIAGNOSIS, PATHOLOGY, AND THERAPEUTICAL INDICATIONS.

BY GOLDING BIRD, A. M., M. D., &c.

A NEW AMERICAN, FROM THE THIRD AND IMPROVED LONDON EDITION.

In one very neat volume, royal 12mo., with over sixty illustrations.

Though the present edition of this well-known work is but little increased in size, it will be found essentially modified throughout, and fully up to the present state of knowledge on its subject. The unanimous testimony of the medical press warrants the publishers in presenting it as a complete and reliable manual for the student of this interesting and important branch of medical science.

BURROWS ON CEREBRAL CIRCULATION.—On Disorders of the Cerebral Circulation, and on the Connection between Affections of the Brain and Diseases of the Heart. In 1 8vo vol., with col'd pls. pp 216.

BLAKISTON ON THE CHEST.—Practical Observations on certain Diseases of the Chest, and on the Principles of Auscultation. In one volume, 8vo., pp. 384.

HASSE'S PATHOLOGICAL ANATOMY.—An Anatomical Description of the Diseases of Respiration and Circulation. Translated and Edited by Swaine. In one volume, 8vo., pp. 379.

FRICK ON THE URINE.—Renal Affections, their Diagnosis and Pathology. In one handsome volume, royal 12mo., with illustrations.

COPLAND ON PALSY.—Of the Causes, Nature, and Treatment of Palsy and Apoplexy. In one volume, royal 12mo. (Just Issued.)

BILLING'S PRINCIPLES.—The Principles of Medicine. Second American, from the Fifth and Improved London Edition. In one octavo volume, extra cloth, 250 pages.

THE PRACTICE OF MEDICINE.

A TREATISE ON
SPECIAL PATHOLOGY AND THERAPEUTICS.

THIRD EDITION.

BY ROBLEY DUNGLISON, M. D.,

Professor of the Institutes of Medicine in the Jefferson Medical College; Lecturer on Clinical Medicine, &c.

In two large octavo volumes, of fifteen hundred pages.

The student of medicine will find, in these two elegant volumes, a mine of facts, a gathering of precepts and advice from the world of experience, that will nerve him with courage, and faithfully direct him in his efforts to relieve the physical sufferings of the race.—*Boston Medical and Surgical Journal.*

Upon every topic embraced in the work the latest information will be found carefully posted up. *Medical Examiner.*

It is certainly the most complete treatise of which we have any knowledge. There is scarcely a disease which the student will not find noticed.—*Western Journal of Medicine and Surgery.*

One of the most elaborate treatises of the kind we have.—*Southern Medical and Surg. Journal.*

NEW AND IMPROVED EDITION—(Now Ready.)

THE HISTORY, DIAGNOSIS, AND TREATMENT OF THE

FEVERS OF THE UNITED STATES.

BY ELISHA BARTLETT, M. D.,

Professor of Materia Medica and Medical Jurisprudence in the College of Physicians and Surgeons, N. Y.

Third Edition, Revised and Improved.

In one very neat octavo volume, of six hundred pages.

In preparing a new edition of this standard work, the author has availed himself of such observations and investigations as have appeared since the publication of his last revision, and he has endeavored in every way to render it worthy of a continuance of the very marked favor with which it has been hitherto received.

The masterly and elegant treatise by Dr. Bartlett is invaluable to the American student and practitioner. —*Dr. Holmes's Report to the Nat. Med. Association.*

We regard it, from the examination we have made of it, the best work on fever extant, in our language, and as such cordially recommend it to the medical public.—*St. Louis Med. and Surg. Journal.*

DISEASES OF THE HEART, LUNGS, AND APPENDAGES;

THEIR SYMPTOMS AND TREATMENT.

BY W. H. WALSHE, M.D.,

Professor of the Principles and Practice of Medicine in University College, London, &c.

In one handsome volume, large royal 12mo. of 512 pages.

THE CYCLOPEDIA OF PRACTICAL MEDICINE;

COMPRISING

Treatises on the Nature and Treatment of Diseases, Materia Medica, and Therapeutics, Diseases of Women and Children, Medical Jurisprudence, &c. &c.

EDITED BY

JOHN FORBES, M. D., F. R. S., ALEXANDER TWEEDIE, M. D., F. R. S.,

AND JOHN CONOLLY, M. D.

Revised, with Additions,

BY ROBLEY DUNGLISON, M. D.

THIS WORK IS NOW COMPLETE, AND FORMS FOUR LARGE SUPER-ROYAL OCTAVO VOLUMES,

Containing Thirty-two Hundred and Fifty-four unusually large Pages in Double Columns, Printed on Good Paper, with a new and clear type.

THE WHOLE WELL AND STRONGLY BOUND, WITH RAISED BANDS AND DOUBLE TITLES.

This work contains no less than FOUR HUNDRED AND EIGHTEEN DISTINCT TREATISES,

By Sixty-eight distinguished Physicians.

The most complete work on Practical Medicine extant; or, at least, in our language.—*Buffalo Medical and Surgical Journal.*

For reference, it is above all price to every practitioner.— *Western Lancet.*

One of the most valuable medical publications of the day—as a work of reference it is invaluable.— *Western Journal of Medicine and Surgery.*

It has been to us, both as learner and teacher, a work for ready and frequent reference, one in which modern English medicine is exhibited in the most advantageous light.—*Medical Examiner.*

We rejoice that this work is to be placed within the reach of the profession in this country, it being unquestionably one of very great value to the practitioner. This estimate of it has not been formed from a hasty examination, but after an intimate acquaintance derived from frequent consultation of it during the past nine or ten years. The editors are practitioners of established reputation, and the list of contributors embraces many of the most eminent professors and teachers of London, Edinburgh, Dublin, and Glasgow. It is, indeed, the great merit of this work that the principal articles have been furnished by practitioners who have not only devoted especial attention to the diseases about which they have written, but have also enjoyed opportunities for an extensive practical acquaintance with them—and whose reputation carries the assurance of their competency justly to appreciate the opinions of others, while it stamps their own doctrines with high and just authority.—*American Medical Journal.*

WATSON'S PRACTICE OF MEDICINE—(New Edition.)

LECTURES ON THE
PRINCIPLES AND PRACTICE OF PHYSIC.
BY THOMAS WATSON, M. D., &c. &c.
Third American, from the last London Edition.
REVISED, WITII ADDITIONS, BY D. FRANCIS CONDIE, M. D.,
Author of "A Treatise on the Diseases of Children," &c.

IN ONE OCTAVO VOLUME,

Of nearly ELEVEN HUNDRED LARGE PAGES, strongly bound with raised bands.

To say that it is the very best work on the subject now extant, is but to echo the sentiment of the medical press throughout the country.—*N. O. Medical Journal.*

Regarded on all hands as one of the very best, if not the very best, systematic treatise on practical medicine extant.—*St. Louis Med. Journal.*

As a text-book it has no equal; as a compendium of pathology and practice no superior.—*N. Y. Annalist.*

We know of no work better calculated for being placed in the hands of the student, and for a text book; on every important point the author seems to have posted up his knowledge to the day.—*Amer. Med. Journal.*

One of the most practically useful books that ever was presented to the student.—*N. Y. Med. Journal.*

We are free to state that a careful examination of this volume has satisfied us that it merits all the commendation bestowed on it in this country and at home. It is a work adapted to the wants of young practitioners, combining, as it does, sound principles and substantial practice. It is not too much to say, that it is a representative of the actual state of medicine as taught and practised by the most eminent physicians of the present day, and as such we would advise every one about embarking in the practice of physic to provide himself with a copy of it.—*Western Journal of Medicine and Surgery.*

For our parts, we are not only willing that our characters as scientific physicians and skilful practitioners may be deduced from doctrines contained in this volume, but we hesitate not to express our belief, that for sound, trustworthy principles, and good substantial practice, it cannot be paralleled by any similar work in any other country. We would advise no one to set himself down in practice unprovided with a copy.—*British and Foreign Medical Review.*

NEW AND IMPROVED EDITION—(Now Ready.)

ON DISEASES OF THE SKIN.
BY ERASMUS WILSON, F. R. S.,
Author of "Human Anatomy," &c.

THIRD AMERICAN FROM THE THIRD LONDON EDITION.

In one neat octavo volume, extra cloth, 430 pages.

Also, to be had with fifteen beautiful steel plates, embracing 165 figures, plain and colored, representing the Normal Anatomy and Pathology of the Skin.

ALSO, THE PLATES SOLD SEPARATE, IN BOARDS.

This edition will be found in every respect much improved over the last. Considerable additions have been made, the arrangement altered, and the whole revised so as to make it fully on a level with the existing state of knowledge on the subjects treated.

As a practical guide to the classification, diagnosis, and treatment of the diseases of the skin, the book is complete. We know nothing, considered in this aspect, better in our language; it is a safe authority on all the ordinary matters which, in this range of diseases, engage the practitioner's attention and possesses the high quality—unknown we believe, to every older manual—of being on a level with science's high-water mark—a sound book of practice.—*London Medical Times.*

WILSON ON SYPHILIS—(Now Ready.)

ON CONSTITUTIONAL AND HEREDITARY SYPHILIS;
AND ON SYPHILITIC ERUPTIONS.
BY ERASMUS WILSON, F. R. S.,
Author of "Human Anatomy," "Diseases of the Skin," &c.

In one very handsome volume, small 8vo., with four beautiful colored plates,

Presenting accurate representations of more than thirty varieties of Syphilitic Diseases of the Skin.

This work is the result of extensive practical experience in the treatment of this disease, and presents some new views on this difficult and important subject, illustrated by numerous cases.

BENEDICT'S CHAPMAN.—Compendium of Chapman's Lectures on the Practice of Medicine. One neat volume, 8vo., pp. 258.

BUDD ON THE LIVER.—On Diseases of the Liver. In one very neat 8vo. vol., with colored plates and wood-cuts, pp. 392.

CHAPMAN'S LECTURES.—Lectures on Fevers, Dropsy, Gout, Rheumatism, &c. &c. In one neat 8vo. volume, pp. 450.

THOMSON ON THE SICK ROOM.—Domestic management of the sick Room, necessary in aid of Medical Treatment for the cure of Diseases. Edited by R. E. Griffith, M. D. In one large royal 12mo. volume, with wood-cuts, pp. 360.

HOPE ON THE HEART.—A Treatise on the Diseases of the Heart and Great Vessels. Edited by Pennock. In one volume, 8vo, with plates, pp. 572.

PHILIPS ON SCROFULA.—Scrofula: its Nature, its Prevalence, its Causes, and the Principles of its Treatment. In one volume, 8vo., with a plate, pp. 360.

NEW AND MUCH IMPROVED EDITION—JUST READY.

BUDD ON THE LIVER.

ON DISEASES OF THE LIVER.

BY GEORGE BUDD, M. D., F. R. S.,

Professor of Medicine in King's College, London; and Fellow of Caius College, Cambridge.

Second American, from the Second and Improved London Edition.

In one very handsome octavo volume.

WITH FOUR BEAUTIFULLY COLORED PLATES, AND NUMEROUS WOOD-CUTS.

The reputation which this work has obtained as a full and practical treatise on an important class of diseases will not be diminished by this improved and enlarged edition. It has been carefully and thoroughly revised by the author; the number of plates has been increased, and the style of its mechanical execution will be found materially improved.

The full digest we have given of the new matter introduced into the present volume, is evidence of the value we place on it. The fact that the profession has required a second edition of a monograph such as that before us, bears honorable testimony to its usefulness. For many years, Dr. Budd's work must be the authority of the great mass of British practitioners on the hepatic diseases: and it is satisfactory that the subject has been taken up by so able and experienced a physician.—*British and Foreign Medico-Chirurgical Review.*

We cannot too strongly recommend the diligent study of this volume. The work cannot fail to rank the name of its author among the most enlightened pathologists and soundest practitioners of the day."—*Medico-Chirurgical Review.*

We feel bound to say that Dr. Budd's treatise is greatly in advance of its predecessors. It is the first work in which the results of microscopical anatomy and the discoveries of modern chemistry have been brought fully to bear upon the pathology and treatment of diseases of the liver; and it is the only work in which a method of studying diseases of this organ, founded upon strictly inductive principles, is developed."—*Dublin Medical Press.*

Having thus attempted to give a brief summary of the more important contents of this work, we would, in conclusion, recommend it to every practitioner and student as well worthy of a careful and patient perusal.—*The New Orleans Medical and Surgical Journal.*

A CLINICAL MANUAL—(Now Ready.)

WHAT TO OBSERVE AT THE BEDSIDE AND AFTER DEATH, IN MEDICAL CASES.

Published under the authority of the London Society for Medical Observation.

In one very handsome volume, royal 12mo., extra cloth.

Did not the perusal of the work justify the high opinion we have of it, the names of Dr. Walshe, the originator, and of Dr Ballard, as the editor of the volume, would almost of itself have satisfied us that it abounds in minute clinical accuracy. Few, besides those more immediately connected with the progress of the book, are aware of how much the value of the work is dependent upon the care and great labor bestowed upon it by Dr. Ballard, who, we happen to know, was engaged for a length of time after it had passed from the hands of the Committee, in perfecting its details and in arranging it for the press. We need not say that the execution of the whole reflects the highest credit not only upon the gentlemen mentioned, but upon all those engaged upon its production. In conclusion, we are convinced that the possession of the work will be almost necessary to every member of the profession—that it will be found indispensable to the practical physician, the pathologist, the medical jurist, and above all to the medical student.—*London Medical Times*, Dec. 11, 1852.

A NEW WORK ON THE SKIN—(Now Ready.)

A PRACTICAL TREATISE ON DISEASES OF THE SKIN.

BY J. MOORE NELIGAN, M. D., M. R. I. A.,

Author of "Medicines, their Uses and Modes of Administration," &c.

In one neat volume, royal 12mo.

We must say he bears off the palm for clearness, conciseness, and rigid plainness of expression. This style enables him to compress much in a single sentence without in any degree injuring the sense, but, on the contrary, making it more comprehensible and impressive. His simplification of the divisions is a striking feature in his descriptions, and yet, by introducing the accumulated subdivisions of other authors as varieties merely, we lose nothing of any real importance. His diagnosis is as it should be, clear and definite, and the broad lines of demarcation are prominently distinguished; so that, rising even from his shortest descriptions, *you do not feel* at all the want of plates or illustrations, the very severest test that can be given to try the effectiveness of cutaneous definitions. By far the largest proportion of the volume is devoted to therapeutic considerations. Not merely are full details of treatment and formulæ given at the close of each section, but an *entire chapter is devoted* to "those general points in therapeutics which are specially applicable to this class of affections." The present work forms a favorable contrast to the voluminous and disputed details of many of its predecessors, and will, we feel assured, be admirably conducive to facilitating the study of the student, and improving the practice of the practitioner.—*Dublin Quarterly Journ. of Med. Science.*

WHITEHEAD ON ABORTION, &c.—The Causes and Treatment of Abortion and Sterility; being the Result of an Extended Practical Inquiry into the Physiological and Morbid Conditions of the Uterus. In one volume, 8vo., pp 368.

WILLIAMS ON RESPIRATORY ORGANS.—A Practical Treatise on Diseases of the Respiratory Organs; including Diseases of the Larynx, Trachea, Lungs, and Pleuræ. With numerous Additions and Notes by M. Clymer, M. D. With wood-cuts. In one octavo volume, pp 508.

DAY ON OLD AGE.—A Practical Treatise on the Domestic Management and more important Diseases of Advanced Life. With an Appendix on a new and successful mode of treating Lumbago and other forms of Chronic Rheumatism. 1 vol. 8vo., pp. 226.

CLYMER ON FEVERS.—Fevers, their Diagnosis, Pathology, and Treatment. Prepared, with large Additions, from "Tweedie's Library of Practical Medicine." In one vol 8vo., pp. 604.

MEIGS ON FEMALES, New and Improved Edition—(Lately Issued.)

WOMAN; HER DISEASES AND THEIR REMEDIES;

A SERIES OF LETTERS TO HIS CLASS.

BY C. D. MEIGS, M. D.,

Professor of Midwifery and Diseases of Women and Children in the Jefferson Medical College of Philadelphia, &c. &c.

In one large and beautifully printed octavo volume, of nearly seven hundred large pages.

"I am happy to offer to my Class an enlarged and amended edition of my Letters on the Diseases of Women; and I avail myself of this occasion to return my heartfelt thanks to them, and to our brethren generally, for the flattering manner in which they have accepted this fruit of my labor."—PREFACE.

The value attached to this work by the profession is sufficiently proved by the rapid exhaustion of the first edition, and consequent demand for a second. In preparing this, the author has availed himself of the opportunity thoroughly to revise and greatly to improve it. The work will therefore be found completely brought up to the day, and in every way worthy of the reputation which it has so immediately obtained.

Professor Meigs has enlarged and amended this great work, for such it unquestionably is, having passed the ordeal of criticism at home and abroad, but been improved thereby; for in this new edition the author has introduced real improvements, and increased the value and utility of the book immeasurably. It presents so many novel, bright and sparkling thoughts; such an exuberance of new ideas on almost every page, that we confess ourselves to have become enamored with the book and its author; and cannot withhold our congratulations from our Philadelphia confreres, that such a teacher is in their service. We regret that our limits will not allow of a more extended notice of this work, but must content ourselves with thus commending it as worthy of diligent perusal by physicians as well as students, who are seeking to be thoroughly instructed in the important practical subjects of which it treats.—*N. Y. Med. Gazette.*

It contains a vast amount of practical knowledge, by one who has accurately observed and retained the experience of many years, and who tells the result in a free, familiar, and pleasant manner.—*Dublin Quarterly Journal.*

There is an off-hand fervor, a glow and a warm-heartedness infecting the effort of Dr. Meigs, which is entirely captivating, and which absolutely hurries the reader through from beginning to end. Besides, the book teems with solid instruction, and it shows the very highest evidence of ability, viz., the clearness with which the information is presented. We know of no better test of one's understanding a subject than the evidence of the power of lucidly explaining it. The most elementary, as well as the obscurest subjects, under the pencil of Prof. Meigs, are isolated and made to stand out in such bold relief, as to produce distinct impressions upon the mind and memory of the reader.—*The Charleston Medical Journal.*

The merits of the first edition of this work were so generally appreciated, and with such a high degree of favor by the medical profession throughout the Union, that we are not surprised in seeing a second edition of it. It is a standard work on the diseases of females and in many respects is one of the very best of its kind in the English language. Upon the appearance of the first edition, we gave the work a cordial reception, and spoke of it in the warmest terms of commendation. Time has not changed the favorable estimate we placed upon it, but has rather increased our convictions of its superlative merits. But we do not now deem it necessary to say more than to commend this work, on the diseases of women, and the remedies for them, to the attention of those practitioners who have not supplied themselves with it. The most select library would be imperfect without it.—*The Western Journal of Medicine and Surgery.*

He is a bold thinker, and possesses more originality of thought and style than almost any American writer on medical subjects. If he is not an elegant writer, there is at least a freshness—a raciness in his mode of expressing himself—that cannot fail to draw the reader after him, even to the close of his work: you cannot nod over his pages; he stimulates rather than narcotises your senses, and the reader cannot lay aside these letters when once he enters into their merits. This, the second edition, is much amended and enlarged, and affords abundant evidence of the author's talents and industry.—*N. O Medical and Surgical Journal.*

The practical writings of Dr. Meigs are second to none.—*The N. Y. Journal of Medicine.*

The excellent practical directions contained in this volume give it great utility, which we trust will not be lost upon our older colleagues; with some condensation, indeed, we should think it well adapted for translation into German.—*Zeitschrift fur die Gesammte Medecin.*

NEW AND IMPROVED EDITION—(Lately Issued.)

A TREATISE ON THE DISEASES OF FEMALES,

AND ON THE SPECIAL HYGIENE OF THEIR SEX.

BY COLOMBAT DE L'ISERE, M. D.

TRANSLATED, WITH MANY NOTES AND ADDITIONS, BY C. D. MEIGS, M D.

SECOND EDITION, REVISED AND IMPROVED.

In one large volume, octavo, of seven hundred and twenty pages, with numerous wood-cuts.

We are satisfied it is destined to take the front rank in this department of medical science. It is in fact a complete exposition of the opinions and practical methods of all the celebrated practitioners of ancient and modern times.—*New York Journ. of Medicine.*

ASHWELL ON THE DISEASES OF FEMALES.

A PRACTICAL TREATISE ON THE DISEASES PECULIAR TO WOMEN.

ILLUSTRATED BY CASES DERIVED FROM HOSPITAL AND PRIVATE PRACTICE.

BY SAMUEL ASHWELL, M. D. WITH ADDITIONS BY PAUL BECK GODDARD, M. D.

Second American edition. In one octavo volume, of 520 pages.

One of the very best works ever issued from the press on the Diseases of Females.—*Western Lancet.*

ON THE CAUSES AND TREATMENT OF ABORTION AND STERILITY. By James Whitehead, M. D., &c. In one volume octavo, of about three hundred and seventy-five pages.

NEW AND IMPROVED EDITION.

ON THE DISEASES OF WOMEN,
INCLUDING THOSE OF PREGNANCY AND CHILDBED.

BY FLEETWOOD CHURCHILL, M. D., M. R. I. A.,
Author of "Theory and Practice of Midwifery," "Diseases of Females," &c.

A New American Edition, Revised by the Author.

WITH NOTES AND ADDITIONS, BY D. FRANCIS CONDIE, M. D.

In one large and handsome octavo volume of 684 pages, with wood-cuts.

To indulge in panegyric, when announcing the fifth edition of any acknowledged medical authority, were to attempt to "gild refined gold." The work announced above, has too long been honored with the term "classical" to leave any doubt as to its true worth, and we content ourselves with remarking, that the author has carefully retained the notes of Dr. Huston, who edited the former American edition, thus really enhancing the value of the work, and paying a well-merited compliment. All who wish to be "posted up" on all that relates to the diseases peculiar to the wife, the mother, or the maid, will hasten to secure a copy of this most admirable treatise.—*The Ohio Medical and Surgical Journal.*

We know of no author who deserves that approbation, on "the diseases of females," to the same extent that Dr. Churchill does. His, indeed, is the only thorough treatise we know of on the subject, and it may be commended to practitioners and students as a masterpiece in its particular department. The former editions of this work have been commended strongly in this journal, and they have won their way to an extended, and a well-deserved popularity. This fifth edition, before us, is well calculated to maintain Dr. Churchill's high reputation. It was revised and enlarged by the author, for his American publishers, and it seems to us that there is scarcely any species of desirable information on its subjects, that may not be found in this work.—*The Western Journal of Medicine and Surgery.*

We are gratified to announce a new and revised edition of Dr. Churchill's valuable work on the diseases of females. We have ever regarded it as one of the very best works on the subjects embraced within its scope, in the English language; and the present edition, enlarged and revised by the author, renders it still more entitled to the confidence of the profession. The valuable notes of Prof. Huston have been retained, and contribute, in no small degree, to enhance the value of the work. It is a source of congratulation that the publishers have permitted the author to be, in this instance, his own editor, thus securing all the revision which an author alone is capable of making.—*The Western Lancet.*

As a comprehensive manual for students, or a work of reference for practitioners, we only speak with common justice when we say that it surpasses any other that has ever issued on the same subject from the British press.—*The Dublin Quarterly Journal.*

Churchill's Monographs on Females—(Lately Issued.)

ESSAYS ON THE PUERPERAL FEVER, AND OTHER DISEASES
PECULIAR TO WOMEN.

SELECTED FROM THE WRITINGS OF BRITISH AUTHORS PREVIOUS TO THE CLOSE OF THE EIGHTEENTH CENTURY.

Edited by FLEETWOOD CHURCHILL, M. D., M. R. I. A.,
Author of "Treatise on the Diseases of Females," &c.

In one neat octavo volume, of about four hundred and fifty pages.

To these papers Dr. Churchill has appended notes, embodying whatever information has been laid before the profession since their authors' time. He has also prefixed to the essays on puerperal fever, which occupy the larger portion of the volume, an interesting historical sketch of the principal epidemics of that disease. The whole forms a very valuable collection of papers by professional writers of eminence, on some of the most important accidents to which the puerperal female is liable.—*American Journal of Medical Sciences.*

***BENNETT ON THE UTERUS*—(*New Edition, Now Ready.*)**

A PRACTICAL TREATISE ON
INFLAMMATION OF THE UTERUS AND ITS APPENDAGES,
AND ON ULCERATION AND INDURATION OF THE NECK OF THE UTERUS.

BY HENRY BENNETT, M. D.,
Obstetric Physician to the Western Dispensary.
Third American Edition.

In one neat octavo volume of 350 pages, with wood-cuts.

Few works issue from the medical press which are at once original and sound in doctrine; but such, we feel assured, is the admirable treatise now before us. The important practical precepts which the author inculcates are all rigidly deduced from facts. . . . Every page of the book is good, and eminently practical. So far as we know and believe, it is the best work on the subject on which it treats.—*Monthly Journal of Medical Science.*

A TREATISE ON THE DISEASES OF FEMALES.

BY W. P. DEWEES, M. D.

NINTH EDITION.

In one volume, octavo. 532 pages, with plates.

MEIGS ON CHILDREN—(Just Issued.)

OBSERVATIONS ON
CERTAIN OF THE DISEASES OF YOUNG CHILDREN.

BY CHARLES D. MEIGS, M. D.,

Professor of Midwifery and of the Diseases of Women and Children in the Jefferson Medical College of Philadelphia, &c. &c.

In one handsome octavo volume of 214 pages.

While this work is not presented to the profession as a systematic and complete treatise on Infantile disorders, the importance of the subjects treated of, and the interest attaching to the views and opinions of the distinguished author must command for it the attention of all who are called upon to treat this interesting class of diseases.

It puts forth no claims as a systematic work, but contains an amount of valuable and useful matter, scarcely to be found in the same space in our home literature. It cannot but prove an acceptable offering to the profession at large.—*N. Y. Journal of Medicine.*

The work before us is undoubtedly a valuable addition to the fund of information which has already been treasured up on the subjects in question. It is practical, and therefore eminently adapted to the general practitioner. Dr. Meigs' works have the same fascination which belongs to himself.—*Medical Examiner.*

This is a most excellent work on the obscure diseases of childhood, and will afford the practitioner and student of medicine much aid in their diagnosis and treatment.—*The Boston Medical and Surgical Journal.*

We take much pleasure in recommending this excellent little work to the attention of medical practitioners. It deserves their attention, and after they commence its perusal, they will not willingly abandon it, until they have mastered its contents. We read the work while suffering from a carbuncle, and its fascinating pages often beguiled us into forgetfulness of agonizing pain. May it teach others to relieve the affections of the young.—*The Western Journal of Medicine and Surgery.*

All of which topics are treated with Dr Meigs' acknowledged ability and original diction. The work is neither a systematic nor a complete treatise upon the diseases of children, but a fragment which may be consulted with much advantage.—*Southern Medical and Surgical Journal.*

NEW WORK BY DR. CHURCHILL.

ON THE
DISEASES OF INFANTS AND CHILDREN.

BY FLEETWOOD CHURCHILL, M. D., M. R. I. A.,

Author of "Theory and Practice of Midwifery," "Diseases of Females," &c.

In one large and handsome octavo volume of over 600 pages.

From Dr. Churchill's known ability and industry, we were led to form high expectations of this work; nor were we deceived. Its learned author seems to have set no bounds to his researches in collecting information which, with his usual systematic address, he has disposed of in the most clear and concise manner, so as to lay before the reader every opinion of importance bearing upon the subject under consideration

We regard this volume as possessing more claims to completeness than any other of the kind with which we are acquainted. Most cordially and earnestly, therefore, do we commend it to our professional brethren, and we feel assured that the stamp of their approbation will in due time be impressed upon it.

After an attentive perusal of its contents, we hesitate not to say, that it is one of the most comprehensive ever written upon the diseases of children, and that, for copiousness of reference, extent of research, and perspicuity of detail, it is scarcely to be equalled, and not to be excelled in any language.—*Dublin Quarterly Journal.*

The present volume will sustain the reputation acquired by the author from his previous works. The reader will find in it full and judicious directions for the management of infants at birth, and a compendious but clear, account of the diseases to which children are liable, and the most successful mode of treating them. We must not close this notice without calling attention to the author's style, which is perspicuous and polished to a degree, we regret to say, not generally characteristic of medical works. We recommend the work of Dr Churchill most cordially, both to students and practitioners, as a valuable and reliable guide in the treatment of the diseases of children.—*Am. Journ. of the Med. Sciences.*

After this meagre, and we know, very imperfect notice, of Dr. Churchill's work, we shall conclude by saying that it is one that cannot fail from its copiousness, extensive research, and general accuracy, to exalt still higher the reputation of the author in this country. The American reader will be particularly pleased to find that Dr. Churchill has done full justice throughout his work, to the various American authors on this subject. The names of Dewees, Eberle, Condie, and Stewart, occur on nearly every page, and these authors are constantly referred to by the author in terms of the highest praise, and with the most liberal courtesy.—*The Medical Examiner.*

We know of no work on this department of Practical Medicine which presents so candid and unprejudiced a statement or posting up of our actual knowledge as this.—*N. Y. Journal of Medicine*

Its claims to merit, both as a scientific and practical work, are of the highest order. Whilst we would not elevate it above every other treatise on the same subject, we certainly believe that very few are equal to it, and none superior.—*Southern Med. and Surg. Journal.*

New and Improved Edition.

A PRACTICAL TREATISE ON THE
DISEASES OF CHILDREN.

BY D. FRANCIS CONDIE, M. D.,
Fellow of the College of Physicians, &c. &c.

Third edition, revised and augmented. In one large volume, 8vo., of over 700 pages.

In the preparation of a third edition of the present treatise, every portion of it has been subjected to a careful revision. A new chapter has been added on Epidemic Meningitis, a disease which, although not confined to children, occurs far more frequently in them, than in adults. In the other chapters of the work, all the more important facts that have been developed since the appearance of the last edition, in reference to the nature, diagnosis, and treatment of the several diseases of which they treat, have been incorporated. The great object of the author has been to present, in each succeeding edition, as full and connected a view as possible of the actual state of the pathology and therapeutics of those affections which most usually occur between birth and puberty.

To the present edition there is appended a list of the several works and essays quoted or referred to in the body of the work, or which have been consulted in its preparation or revision.

Every important fact that has been verified or developed since the publication of the previous edition, either in relation to the nature, diagnosis, or treatment of the diseases of children, have been arranged and incorporated into the body of the work: thus posting up to date, to use a counting-house phrase, all the valuable facts and useful information on the subject. To the American practitioner, Dr. Condie's remarks on the diseases of children will be invaluable, and we accordingly advise those who have failed to read this work to procure a copy, and make themselves familiar with its sound principles.—*The New Orleans Medical and Surgical Journal.*

We feel persuaded that the American Medical profession will soon regard it, not only as a very good, but as the VERY BEST "Practical Treatise on the Diseases of Children."—*American Medical Journal*

We pronounced the first edition to be the best work on the Diseases of Children in the English language, and, notwithstanding all that has been published, we still regard it in that light.—*Medical Examiner.*

From Professor Wm. P. Johnston, Washington, D. C.

I make use of it as a text-book, and place it invariably in the hands of my private pupils.

From Professor D. Humphreys Storer, of Boston.

I consider it to be the best work on the Diseases of Children we have access to, and as such recommend it to all who ever refer to the subject.

From Professor M. M. Pallen, of St Louis.

I consider it the best treatise on the Diseases of Children that we possess, and as such have been in the habit of recommending it to my classes.

Dr. Condie's scholarship, acumen, industry, and practical sense are manifested in this, as in all his numerous contributions to science.—*Dr. Holmes's Report to the American Medical Association.*

Taken as a whole, in our judgment, Dr. Condie's Treatise is the one from the perusal of which the practitioner in this country will rise with the greatest satisfaction.—*Western Journal of Medicine and Surgery.*

One of the best works upon the Diseases of Children in the English language.—*Western Lancet.*

We feel assured from actual experience that no physician's library can be complete without a copy of this work.—*N Y. Journal of Medicine*

Perhaps the most full and complete work now before the profession of the United States; indeed, we may say in the English language. It is vastly superior to most of its predecessors.—*Transylvania Med Journal.*

A veritable pædiatric encyclopædia, and an honor to American medical literature.—*Ohio Medical and Surgical Journal.*

WEST ON DISEASES OF CHILDREN.

LECTURES ON THE
DISEASES OF INFANCY AND CHILDHOOD.

BY CHARLES WEST, M. D.,
Senior Physician to the Royal Infirmary for Children, &c. &c.

In one volume, octavo.

Every portion of these lectures is marked by a general accuracy of description, and by the soundness of the views set forth in relation to the pathology and therapeutics of the several maladies treated of. The lectures on the diseases of the respiratory apparatus, about one-third of the whole number, are particularly excellent, forming one of the fullest and most able accounts of these affections, as they present themselves during infancy and childhood, in the English language. The history of the several forms of phthisis during these periods of existence, with their management, will be read by all with deep interest.—*The American Journal of the Medical Sciences.*

The Lectures of Dr. West, originally published in the London Medical Gazette, form a most valuable addition to this branch of practical medicine. For many years physician to the Children's Infirmary, his opportunities for observing their diseases have been most extensive, no less than 14,000 children having been brought under his notice during the past nine years. These have evidently been studied with great care, and the result has been the production of the very best work in our language, so far as it goes, on the diseases of this class of our patients. The symptomatology and pathology of their diseases are especially exhibited most clearly; and we are convinced that no one can read with care these lectures without deriving from them instruction of the most important kind.—*Charleston Med. Journal.*

A TREATISE
ON THE PHYSICAL AND MEDICAL TREATMENT OF CHILDREN.
BY W. P. DEWEES, M. D.

Ninth edition. In one volume, octavo, of 548 pages.

NEW AND IMPROVED EDITION—(Just Issued.)

OBSTETRICS:

THE SCIENCE AND THE ART.

BY CHARLES D. MEIGS, M. D.,

Professor of Midwifery and the Diseases of Women and Children in the Jefferson Medical College, Philadelphia, &c. &c.

Second Edition, Revised and Improved, with 131 Illustrations.

In one beautifully printed octavo volume, of seven hundred and fifty-two large pages.

The rapid demand for a second edition of this work is a sufficient evidence that it has supplied a desideratum of the profession, notwithstanding the numerous treatises on the same subject which have appeared within the last few years. Adopting a system of his own, the author has combined the leading principles of his interesting and difficult subject, with a thorough exposition of its rules of practice, presenting the results of long and extensive experience and of familiar acquaintance with all the modern writers on this department of medicine. As an American treatise on Midwifery, which has at once assumed the position of a classic, it possesses peculiar claims to the attention and study of the practitioner and student, while the numerous alterations and revisions which it has undergone in the present edition are shown by the great enlargement of the work which is not only increased as to the size of the page, but also in the number. Among other additions may be mentioned

A NEW AND IMPORTANT CHAPTER ON "CHILD-BED FEVER."

As an elementary treatise—concise, but, withal, clear and comprehensive—we know of no one better adapted for the use of the student; while the young practitioner will find in it a body of sound doctrine and a series of excellent practical directions, adapted to all the conditions of the various forms of labor and their results, which he will be induced, we are persuaded, again and again to consult, and always with profit.

It has seldom been our lot to peruse a work upon the subject, from which we have received greater satisfaction, and which we believe to be better calculated to communicate to the student correct and definite views upon the several topics embraced within the scope of its teachings.—*American Journal of the Medical Sciences.*

We are acquainted with no work on midwifery of greater practical value.—*Boston Medical and Surgical Journal.*

Worthy the reputation of its distinguished author.—*Medical Examiner.*

We most sincerely recommend it, both to the student and practitioner, as a more complete and valuable work on the Science and Art of Midwifery, than any of the numerous reprints and American editions of European works on the same subject.—*N. Y. Annalist.*

We have, therefore, great satisfaction in bringing under our reader's notice the matured views of the highest American authority in the department to which he has devoted his life and talents.—*London Medical Gazette.*

An author of established merit, a professor of Midwifery, and a practitioner of high reputation and immense experience—we may assuredly regard his work now before us as representing the most advanced state of obstetric science in America up to the time at which he writes. We consider Dr. Meigs' book as a valuable acquisition to obstetric literature, and one that will very much assist the practitioner under many circumstances of doubt and perplexity.—*The Dublin Quarterly Journal.*

These various heads are subdivided so well, so lucidly explained, that a good memory is all that is necessary in order to put the reader in possession of a thorough knowledge of this important subject. Dr. Meigs has conferred a great benefit on the profession in publishing this excellent work.—*St. Louis Medical and Surgical Journal.*

TYLER SMITH ON PARTURITION.

ON PARTURITION,

AND THE PRINCIPLES AND PRACTICE OF OBSTETRICS

BY W. TYLER SMITH, M. D.,

Lecturer on Obstetrics in the Hunterian School of Medicine, &c. &c.

In one large duodecimo volume, of 400 pages.

The work will recommend itself by its intrinsic merit to every member of the profession.—*Lancet.*

We can imagine the pleasure with which William Hunter or Denman would have welcomed the present work; certainly the most valuable contribution to obstetrics that has been made since their own day. For ourselves, we consider its appearance as the dawn of a new era in this department of medicine. We can most cordially recommend the work as one absolutely necessary to be studied by every accoucheur. It will, we may add, prove equally interesting and instructive to the student, the general practitioner, and pure obstetrician. It was a bold undertaking to reclaim parturition for Reflex Physiology, and it has been well performed.—*London Journal of Medicine.*

LEE'S CLINICAL MIDWIFERY.

CLINICAL MIDWIFERY,

COMPRISING THE HISTORIES OF FIVE HUNDRED AND FORTY-FIVE CASES OF DIFFICULT, PRETERNATURAL, AND COMPLICATED LABOR, WITH COMMENTARIES.

BY ROBERT LEE, M. D., F. R. S., &c.

From the 2d London Edition.

In one royal 12mo. volume, extra cloth, of 238 pages.

More instructive to the juvenile practitioner than a score of systematic works.—*Lancet.*

An invaluable record for the practitioner.—*N. Y. Annalist.*

A storehouse of valuable facts and precedents.—*American Journal of the Medical Sciences.*

CHURCHILL'S MIDWIFERY, BY CONDIE, NEW AND IMPROVED EDITION—(Just Issued.)

ON THE

THEORY AND PRACTICE OF MIDWIFERY.

BY FLEETWOOD CHURCHILL, M. D., &c.

A NEW AMERICAN FROM THE LAST AND IMPROVED ENGLISH EDITION.

EDITED, WITH NOTES AND ADDITIONS,

BY D. FRANCIS CONDIE, M. D.,

Author of a "Practical Treatise on the Diseases of Children," &c.

WITH ONE HUNDRED AND THIRTY-NINE ILLUSTRATIONS.

In one very handsome octavo volume.

In the preparation of the last English edition, from which this is printed, the author has spared no pains, with the desire of bringing it thoroughly up to the present state of obstetric science. The labors of the editor have thus been light, but he has endeavored to supply whatever he has thought necessary to the work, either as respects obstetrical practice in this country, or its progress in Europe since the appearance of Dr. Churchill's last edition. Most of the notes of the former editor, Dr. Huston, have been retained by him, where they have not been embodied by the author in his text. The present edition of this favorite text-book is therefore presented to the profession in the full confidence of its meriting a continuance of the great reputation which it has acquired as a work equally well fitted for the student and practitioner.

To bestow praise on a book that has received such marked approbation would be superfluous. We need only say, therefore, that if the first edition was thought worthy of a favorable reception by the medical public, we can confidently affirm that this will be found much more so. The lecturer, the practitioner, and the student, may all have recourse to its pages, and derive from their perusal much interest and instruction in everything relating to theoretical and practical midwifery.—*Dublin Quarterly Journal of Medical Science.*

A work of very great merit, and such as we can confidently recommend to the study of every obstetric practitioner.—*London Medical Gazette.*

This is certainly the most perfect system extant. It is the best adapted for the purposes of a text-book, and that which he whose necessities confine him to one book, should select in preference to all others.—*Southern Medical and Surgical Journal.*

The most popular work on Midwifery ever issued from the American press.—*Charleston Medical Journal.*

Certainly, in our opinion, the very best work on the subject which exists.—*N. Y. Annalist.*

Were we reduced to the necessity of having but *one* work on Midwifery, and *permitted to choose*, we would unhesitatingly take Churchill.—*Western Medical and Surgical Journal.*

It is impossible to conceive a more useful and elegant Manual than Dr. Churchill's Practice of Midwifery.—*Provincial Medical Journal.*

No work holds a higher position, or is more deserving of being placed in the hands of the tyro, the advanced student, or the practitioner.—*Medical Examiner.*

NEW EDITION OF RAMSBOTHAM ON PARTURITION.

THE PRINCIPLES AND PRACTICE OF

OBSTETRIC MEDICINE AND SURGERY,

In reference to the Process of Parturition.

BY FRANCIS H. RAMSBOTHAM, M. D.,

Physician to the Royal Maternity Charity, &c. &c.

SIXTH AMERICAN, FROM THE LAST LONDON EDITION.

Illustrated with One Hundred and Forty-eight Figures on Fifty-five Lithographic Plates.

In one large and handsomely printed volume, imperial octavo, with 520 pages.

In this edition the plates have all been redrawn, and the text carefully read and corrected. It is therefore presented as in every way worthy the favor with which it has so long been received.

From Professor Hodge, of the University of Pennsylvania.

To the American public, it is most valuable, from its intrinsic undoubted excellence, and as being the best authorized exponent of British Midwifery. Its circulation will, I trust, be extensive throughout our country.

We recommend the student, who desires to master this difficult subject with the least possible trouble, to possess himself at once of a copy of this work.—*American Journal of the Medical Sciences.*

It stands at the head of the long list of excellent obstetric works published in the last few years in Great Britain, Ireland, and the Continent of Europe. We consider this book indispensable to the library of every physician engaged in the practice of Midwifery.—*Southern Medical and Surgical Journal.*

When the whole profession is thus unanimous in placing such a work in the very first rank as regards the extent and correctness of all the details of the theory and practice of so important a branch of learning, our commendation or condemnation would be of little consequence; but, regarding it as the most useful of all works of the kind, we think it but an act of justice to urge its claims upon the profession.—*N. O. Med. Journal.*

DEWEES'S MIDWIFERY.

A COMPREHENSIVE SYSTEM OF MIDWIFERY.

ILLUSTRATED BY OCCASIONAL CASES AND MANY ENGRAVINGS.

BY WILLIAM P. DEWEES, M. D.

Tenth Edition, with the Author's last Improvements and Corrections. In one octavo volume, of 600 pages.

PEREIRA'S MATERIA MEDICA—Vol. I.—(Now Ready.)

NEW EDITION, GREATLY IMPROVED AND ENLARGED.

THE ELEMENTS OF
MATERIA MEDICA AND THERAPEUTICS.

BY JONATHAN PEREIRA, M. D., F. R. S. AND L. S.

THIRD AMERICAN EDITION,

ENLARGED AND IMPROVED BY THE AUTHOR, INCLUDING NOTICES OF MOST OF THE MEDICINAL SUBSTANCES IN USE IN THE CIVILIZED WORLD, AND FORMING AN ENCYCLOPÆDIA OF MATERIA MEDICA.

EDITED BY JOSEPH CARSON, M. D.,

Professor of Materia Medica and Pharmacy in the University of Pennsylvania.

In two very large volumes, on small type, with about four hundred illustrations.

The demand for this new edition of "PEREIRA'S MATERIA MEDICA" has induced the publishers to issue the First Volume separately. The Second Volume, now at press, and receiving important corrections and revisions from both author and editor, may be shortly expected for publication.

The third London edition of this work received very extensive alterations by the author. Many portions of it were entirely rewritten, some curtailed, others enlarged, and much new matter introduced in every part. The edition, however, now presented to the American profession, in addition to this, not only enjoys the advantages of a thorough and accurate superintendence by the editor, but also embodies the additions and alterations suggested by a further careful revision by the author, expressly for this country, embracing the most recent investigations, and the result of several new Pharmacopœias which have appeared since the publication of the London edition of Volume I. The notes of the American editor have been prepared with reference to the new edition of the U. S. Pharmacopœia, and contain such matter generally as is requisite to adapt it fully to the wants of the profession in this country, as well as such recent discoveries as have escaped the attention of the author. In this manner the size of the work has been materially enlarged, and the number of illustrations much increased, while its mechanical execution has been greatly improved in every respect. The profession may therefore rely on being able to procure a work which, in every point of view, will not only maintain, but greatly advance the very high reputation which it has everywhere acquired.

The work, in its present shape, and so far as can be judged from the portion before the public, forms the most comprehensive and complete treatise on materia medica extant in the English language. Dr. Pereira has been at great pains to introduce into his work, not only all the information on the natural, chemical and commercial history of medicines, which might be serviceable to the physician and surgeon, but whatever might enable his readers to understand thoroughly the mode of preparing and manufacturing various articles employed either for preparing medicines, or for certain purposes in the arts connected with materia medica and the practice of medicine. The accounts of the physiological and therapeutic effects of remedies are given with great clearness and accuracy, and in a manner calculated to interest as well as instruct the reader.—*The Edinburgh Medical and Surgical Journal.*

ROYLE'S MATERIA MEDICA.

MATERIA MEDICA AND THERAPEUTICS;

INCLUDING THE

Preparations of the Pharmacopœias of London, Edinburgh, Dublin, and of the United States.

WITH MANY NEW MEDICINES.

BY J. FORBES ROYLE, M. D., F. R. S.,

Professor of Materia Medica and Therapeutics, King's College, London, &c. &c.

EDITED BY JOSEPH CARSON, M. D.,

Professor of Materia Medica and Pharmacy in the University of Pennsylvania.

WITH NINETY-EIGHT ILLUSTRATIONS.

In one large octavo volume, of about seven hundred pages.

Being one of the most beautiful Medical works published in this country.

This work is, indeed, a most valuable one, and will fill up an important vacancy that existed between Dr. Pereira's most learned and complete system of Materia Medica, and the class of productions on the other extreme, which are necessarily imperfect from their small extent.—*British and Foreign Medical Review.*

POCKET DISPENSATORY AND FORMULARY.

A DISPENSATORY AND THERAPEUTICAL REMEMBRANCER. Comprising the entire lists of Materia Medica, with every Practical Formula contained in the three British Pharmacopœias. With relative Tables subjoined, illustrating by upwards of six hundred and sixty examples, the Extemporaneous Forms and Combinations suitable for the different Medicines. By JOHN MAYNE, M. D., L. R. C. S., EDIN., &c. &c. Edited, with the addition of the formulæ of the United States Pharmacopœia, by R. EGLESFELD GRIFFITH, M. D. In one 12mo. volume, of over three hundred large pages.

The neat typography, convenient size, and low price of this volume, recommend it especially to physicians, apothecaries, and students in want of a pocket manual.

NEW UNIVERSAL FORMULARY.—(Lately Issued.)

A UNIVERSAL FORMULARY,

CONTAINING THE

METHODS OF PREPARING AND ADMINISTERING

OFFICINAL AND OTHER MEDICINES.

THE WHOLE ADAPTED TO PHYSICIANS AND PHARMACEUTISTS.

BY R. EGLESFELD GRIFFITH, M. D.,

Author of "American Medical Botany," &c.

In one large octavo volume of 568 pages, double columns.

A valuable acquisition to the medical practitioner, and a useful book of reference to the apothecary on numerous occasions.—*American Journal of Pharmacy.*

Dr. Griffith's Formulary is worthy of recommendation, not only on account of the care which has been bestowed on it by its estimable author, but for its general accuracy, and the richness of its details.—*Medical Examiner.*

Most cordially we recommend this Universal Formulary, not forgetting its adaptation to druggists and apothecaries, who would find themselves vastly improved by a familiar acquaintance with this every-day book of medicine.—*The Boston Medical and Surgical Journal.*

Pre-eminent among the best and most useful compilations of the present day will be found the work before us, which can have been produced only at a very great cost of thought and labor. A short description will suffice to show that we do not put too high an estimate on this work. We are not cognizant of the existence of a parallel work. Its value will be apparent to our readers from the sketch of its contents above given.

We strongly recommend it to all who are engaged either in practical medicine, or more exclusively with its literature.—*London Medical Gazette.*

A very useful work, and a most complete compendium on the subject of materia medica. We know of no work in our language, or any other, so comprehensive in all its details.—*London Lancet.*

The vast collection of formulæ which is offered by the compiler of this volume, contains a large number which will be new to English practitioners, some of them from the novelty of their ingredients, and others from the unaccustomed mode in which they are combined; and we doubt not that several of these might be advantageously brought into use. The authority for every formula is given, and the list includes a very numerous assemblage of Continental, as well as of British and American writers of repute. It is, therefore, a work to which every practitioner may advantageously resort for hints to increase his stock of remedies and of forms of prescription.

The other indices facilitate reference to every article in the "Formulary;" and they appear to have been drawn up with the same care as that which the author has evidently bestowed on every part of the work.—*The British and Foreign Medico-Chirurgical Review.*

CHRISTISON & GRIFFITH'S DISPENSATORY.—(A New Work.)

A DISPENSATORY,

OR, COMMENTARY ON THE PHARMACOPŒIAS OF GREAT BRITAIN AND THE UNITED STATES: COMPRISING THE NATURAL HISTORY, DESCRIPTION, CHEMISTRY, PHARMACY, ACTIONS, USES, AND DOSES OF THE ARTICLES OF THE MATERIA MEDICA.

BY ROBERT CHRISTISON, M. D., V. P. R. S. E.,

President of the Royal College of Physicians of Edinburgh; Professor of Materia Medica in the University of Edinburgh, etc.

Second Edition, Revised and Improved,

WITH A SUPPLEMENT CONTAINING THE MOST IMPORTANT NEW REMEDIES.

WITH COPIOUS ADDITIONS,

AND TWO HUNDRED AND THIRTEEN LARGE WOOD ENGRAVINGS.

BY R. EGLESFELD GRIFFITH, M. D.,

Author of "A Medical Botany," etc.

In one very large and handsome octavo volume, of over one thousand closely-printed pages, with numerous wood-cuts, beautifully printed on fine white paper, presenting an immense quantity of matter at an unusually low price.

It is enough to say that it appears to us as perfect as a Dispensatory, in the present state of pharmaceutical science, could be made.—*The Western Journal of Medicine and Surgery.*

***CARSON'S SYNOPSIS*—(*Just Issued.*)**

SYNOPSIS OF THE

COURSE OF LECTURES ON MATERIA MEDICA AND PHARMACY,

Delivered in the University of Pennsylvania.

BY JOSEPH CARSON, M. D.,

Professor of Materia Medica and Pharmacy in the University of Pennsylvania.

In one very neat octavo volume of 208 pages.

THE THREE KINDS OF COD-LIVER OIL,

Comparatively considered, with their Chemical and Therapeutic Properties, by L. J. DE JONGH, M. D. Translated, with an Appendix and Cases, by EDWARD CAREY, M. D. To which is added an article on the subject from "Dunglison on New Remedies." In one small 12mo. volume, extra cloth.

DUNGLISON'S THERAPEUTICS.

NEW AND IMPROVED EDITION.—(Lately Issued.)

GENERAL THERAPEUTICS AND MATERIA MEDICA

ADAPTED FOR A MEDICAL TEXT-BOOK,

BY ROBLEY DUNGLISON, M. D.,

Professor of Institutes of Medicine, &c., in Jefferson Medical College; Late Professor of Materia Medica, &
in the Universities of Maryland and Virginia, and in Jefferson Medical College.

FOURTH EDITION, MUCH IMPROVED.

With One Hundred and Eighty-two Illustrations.

In two large and handsomely printed octavo volumes.

The present edition of this standard work has been subjected to a thorough revision both as r
gards style and matter, and has thus been rendered a more complete exponent than heretofore
the existing state of knowledge on the important subjects of which it treats. The favor with whi
the former editions have everywhere been received seemed to demand that the present should
rendered still more worthy of the patronage of the profession, and of the medical student in partic
lar, for whose use more especially it is proposed; while the number of impressions through wh
it has passed has enabled the author so to improve it as to enable him to present it with some d
gree of confidence as well adapted to the purposes for which it is intended. In the present editio
the remedial agents of recent introduction have been inserted in their appropriate places; t
number of illustrations has been greatly increased, and a copious index of diseases and remedi
has been appended, improvements which can scarcely fail to add to the value of the work to t
therapeutical inquirer.

The publishers, therefore, confidently present the work as it now stands to the notice of t
practitioner as a trustworthy book of reference, and to the student, for whom it was more especial
prepared, as a full and reliable text-book on General Therapeutics and Materia Medica.

Notwithstanding the increase in size and number of illustrations, and the improvements in t
mechanical execution of the work, its price has not been increased.

In this work of Dr. Dunglison, we recognize the same untiring industry in the collection and embodying
facts on the several subjects of which he treats, that has heretofore distinguished him, and we cheerfu
point to these volumes, as two of the most interesting that we know of. In noticing the additions to this
fourth edition, there is very little in the periodical or annual literature of the profession, published in the
terval which has elapsed since the issue of the first, that has escaped the careful search of the author.
a book for reference, it is invaluable.—*Charleston Med. Journal and Review.*

It may be said to be *the* work now upon the subjects upon which it treats.—*Western Lancet.*

As a text book for students, for whom it is particularly designed, we know of none superior to it.—
Louis Medical and Surgical Journal.

It purports to be a new edition, but it is rather a new book, so greatly has it been improved both in t
amount and quality of the matter which it contains.—*N. O. Medical and Surgical Journal.*

We bespeak for this edition from the profession an increase of patronage over any of its former ones,
account of its increased merit.—*N. Y. Journal of Medicine.*

We consider this work unequalled.—*Boston Med. and Surg. Journal.*

NEW AND MUCH IMPROVED EDITION.

NEW REMEDIES,

WITH FORMULÆ FOR THEIR ADMINISTRATION.

BY ROBLEY DUNGLISON, M. D.,

PROFESSOR OF THE INSTITUTES OF MEDICINE, ETC. IN THE JEFFERSON MEDICAL COLLEGE OF PHILADELPHIA.

Sixth Edition, with extensive Additions.

In one very large octavo volume, of over seven hundred and fifty pages.

The fact that this work has rapidly passed to a SIXTH EDITION is sufficient proof that it has supplied
desideratum to the profession in presenting them with a clear and succinct account of all new and impo
ant additions to the materia medica, and novel applications of old remedial agents. In the prepara on
the present edition, the author has shrunk from no labor to render the volume worthy of a continuance of t
favor with which it has been received, as is sufficiently shown by the increase of about one hundred pag
in the size of the work. The necessity of such large additions arises from the fact that the last few yea
have been rich in valuable gifts to Therapeutics; and amongst these, ether, chloroform, and other so-call
anæsthetics, are worthy of special attention. They have been introduced since the appearance of the
edition of the "NEW REMEDIES." Other articles have been proposed for the first time, and the experience
observers has added numerous interesting facts to our knowledge of the virtues of remedial agents pr
viously employed.

The therapeutical agents now first admitted into this work, some of which have been newly introduc
into pharmacology, and the old agents brought prominently forward with novel applications, and which m
consequently be regarded as *New Remedies*, are the following:—Adansonia digitata, Benzoate of Ammon
Valerianate of Bismuth, Sulphate of Cadmium, Chloroform, Collodion, Cantharidal Collodion, Cotyledon U
bilicus, Sulphuric Ether, Strong Chloric Ether, Compound Ether, Hura Brasiliensis, Iberis Amara, Iod
Acid, Iodide of Chloride of Mercury, Powdered Iron, Citrate of Magnetic Oxide of Iron, Citrate of Iron a
Magnesia, Sulphate of Iron and Alumina, Tannate of Iron, Valerianate of Iron, Nitrate of Lead, Lem
Juice, Citrate of Magnesia, Salts of Manganese, Oleum Cadinum, Arsenite of Quinia, Hydriodate of Iron a
Quinia, Sanicula Marilandica, and Sumbul.

MOHR, REDWOOD, AND PROCTER'S PHARMACY.—(Lately Issued.)

PRACTICAL PHARMACY.

COMPRISING THE ARRANGEMENTS, APPARATUS, AND MANIPULATIONS OF THE PHARMACEUTICAL SHOP AND LABORATORY.

BY FRANCIS MOHR, PH. D.,
Assessor Pharmaciæ of the Royal Prussian College of Medicine, Coblentz;
AND THEOPHILUS REDWOOD,
Professor of Pharmacy in the Pharmaceutical Society of Great Britain.
EDITED, WITH EXTENSIVE ADDITIONS, BY PROFESSOR WILLIAM PROCTER,
Of the Philadelphia College of Pharmacy.

In one handsomely printed octavo volume, of 570 pages, with over 500 engravings on wood.

To physicians in the country, and those at a distance from competent pharmaceutists, as well as to apothecaries, this work will be found of great value, as embodying much important information which is to be met with in no other American publication.

After a pretty thorough examination, we can recommend it as a highly useful book, which should be in the hands of every apothecary. Although no instruction of this kind will enable the beginner to acquire that practical skill and readiness which experience only can confer, we believe that this work will much facilitate their acquisition, by indicating means for the removal of difficulties as they occur, and suggesting methods of operation in conducting pharmaceutic processes which the experimenter would only hit upon after many unsuccessful trials; while there are few pharmaceutists, of however extensive experience, who will not find in it valuable hints that they can turn to use in conducting the affairs of the shop and laboratory. The mechanical execution of the work is in a style of unusual excellence. It contains about five hundred and seventy large octavo pages, handsomely printed on good paper, and illustrated by over five hundred remarkably well executed wood-cuts of chemical and pharmaceutical apparatus. It comprises the whole of Mohr and Redwood's book, as published in London, rearranged and classified by the American editor, who has added much valuable new matter, which has increased the size of the book more than one-fourth, including about one hundred additional wood-cuts.—*The American Journ. of Pharmacy.*

It is a book, however, which will be in the hands of almost every one who is much interested in pharmaceutical operations, as we know of no other publication so well calculated to fill a void long felt.—*The Medical Examiner.*

The country practitioner who is obliged to dispense his own medicines, will find it a most valuable assistant.—*Monthly Journal and Retrospect.*

The book is strictly practical, and describes only manipulations or methods of performing the numerous processes the pharmaceutist has to go through, in the preparation and manufacture of medicines, together with all the apparatus and fixtures necessary thereto. On these matters, this work is very full and complete, and details, in a style uncommonly clear and lucid, not only the more complicated and difficult processes, but those not less important ones, the most simple and common. The volume is an octavo of five hundred and seventy-six pages. It is elegantly illustrated with a multitude of neat wood engravings, and is unexceptionable in its whole typographical appearance and execution. We take great satisfaction in commending this so much needed treatise, not only to those for whom it is more specially designed, but to the medical profession generally—to every one, who, in his practice, has occasion to prepare, as well as administer medical agents.—*Buffalo Medical Journal.*

NEW AND COMPLETE MEDICAL BOTANY.

MEDICAL BOTANY;

OR, A DESCRIPTION OF ALL THE MORE IMPORTANT PLANTS USED IN MEDICINE, AND OF THEIR PROPERTIES, USES, AND MODES OF ADMINISTRATION.

BY R. EGLESFELD GRIFFITH, M. D., &c. &c.

In one large 8vo. vol. of 704 pages, handsomely printed, with nearly 350 illustrations on wood.

One of the greatest acquisitions to American medical literature. It should by all means be introduced, at the very earliest period, into our medical schools, and occupy a place in the library of every physician in the land.—*Southwestern Medical Advocate.*

Admirably calculated for the physician and student—we have seen no work which promises greater advantages to the profession.—*N. O. Medical and Surgical Journal.*

One of the few books which supply a positive deficiency in our medical literature.—*Western Lancet.*

We hope the day is not distant when this work will not only be a text-book in every medical school and college in the Union, but find a place in the library of every private practitioner.—*N. Y. Journ. of Medicine.*

ELLIS'S MEDICAL FORMULARY.—(Improved Edition.)

THE MEDICAL FORMULARY:

BEING A COLLECTION OF PRESCRIPTIONS, DERIVED FROM THE WRITINGS AND PRACTICE OF MANY OF THE MOST EMINENT PHYSICIANS OF AMERICA AND EUROPE.

To which is added an Appendix, containing the usual Dietetic Preparations and Antidotes for Poisons.

THE WHOLE ACCOMPANIED WITH A FEW BRIEF PHARMACEUTIC AND MEDICAL OBSERVATIONS.

BY BENJAMIN ELLIS, M. D.

NINTH EDITION, CORRECTED AND EXTENDED, BY SAMUEL GEORGE MORTON M. D.

In one neat octavo volume of 268 pages.

CARPENTER ON ALCOHOLIC LIQUORS.—(A New Work.)

A Prize Essay on the Use of Alcoholic Liquors in Health and Disease. By William B. Carpenter, M. D., author of "Principles of Human Physiology," &c. In one 12mo. volume.

***NEW EDITION OF GRAHAM'S CHEMISTRY*—(*Now Ready.*)**

ELEMENTS OF CHEMISTRY;

INCLUDING THE APPLICATIONS OF THE SCIENCE IN THE ARTS.

BY THOMAS GRAHAM, F. R. S., &c.

Second American, from the entirely Revised, and greatly Enlarged, Second London Edition.

WITH NOTES AND ADDITIONS BY ROBERT BRIDGES, M. D.

To be complete in one very large octavo volume, with several hundred beautiful illustrations.

PART I, now ready, of about 450 large pages, with 185 illustrations.
PART II, completing the work, preparing for early publication.

The great changes which the science of chemistry has undergone within the last few years, render a new edition of a treatise like the present almost a new work. The author has devoted several years to the revision of his treatise, and has endeavored to embody in it every fact and inference of importance which has been observed and recorded by the great body of chemical investigators who are so rapidly changing the face of the science. In this manner the work has been greatly increased in size, and the number of illustrations doubled; while the labors of the editor have been directed towards the introduction of such matters as have escaped the attention of the author, or as have arisen since the publication of the first portion of this edition in London, in 1850. Printed in handsome style, and at a very low price, it is therefore confidently presented to the profession and the student as a very complete and thorough text-book of this important subject.

NEW AND IMPROVED EDITION—(Lately Issued.)

ELEMENTARY CHEMISTRY,

THEORETICAL AND PRACTICAL.

BY GEORGE FOWNES, PH. D.,

Chemical Lecturer in the Middlesex Hospital Medical School, &c. &c.

WITH NUMEROUS ILLUSTRATIONS.

THIRD AMERICAN, FROM A LATE LONDON EDITION. EDITED, WITH ADDITIONS,

BY ROBERT BRIDGES, M. D.,

Professor of General and Pharmaceutical Chemistry in the Philadelphia College of Pharmacy, &c. &c.

In one large royal 12mo. vol., of over 500 pages, with about 180 wood-cuts, sheep or extra cloth.

The work of Dr. Fownes has long been before the public, and its merits have been fully appreciated as the best text-book on Chemistry now in existence. We do not, of course, place it in a rank superior to the works of Brande, Graham, Turner, Gregory, or Gmelin, but we say that, as a work for students, it is preferable to any of them.—*London Journal of Medicine.*

The rapid sale of this Manual evinces its adaptation to the wants of the student of chemistry, whilst the well known merits of its lamented author have constituted a guarantee for its value, as a faithful exposition of the general principles and most important facts of the science to which it professes to be an introduction.—*The British and Foreign Medico-Chirurgical Review.*

A work well adapted to the wants of the student. It is an excellent exposition of the chief doctrines and facts of modern chemistry, originally intended as a guide to the lectures of the author, corrected by his own hand shortly before his death in 1849 and recently revised by Dr. Bence Jones, who has made some additions to the chapter on animal chemistry. Although not intended to supersede the more extended treatises on chemistry, Professor Fownes' Manual may, we think, be often used as a work of reference, even by those advanced in the study, who may be desirous of refreshing their memory on some forgotten point. The size of the work, and still more the condensed yet perspicuous style in which it is written, absolve it from the charges very properly urged against most manuals termed popular, viz., of omitting details of indispensable importance, of avoiding technical difficulties instead of explaining them, and of treating subjects of high scientific interest in an unscientific way.—*Edinburgh Monthly Journal of Medical Science.*

BOWMAN'S MEDICAL CHEMISTRY—(Lately Issued.)

PRACTICAL HANDBOOK OF MEDICAL CHEMISTRY.

BY JOHN E. BOWMAN, M. D.

In one neat volume, royal 12mo., with numerous illustrations.

Mr. Bowman has succeeded in supplying a desideratum in medical literature. In the little volume before us, he has given a concise but comprehensive account of all matters in chemistry which the man in practice may desire to know.—*Lancet.*

BY THE SAME AUTHOR—(Lately Issued.)

INTRODUCTION TO PRACTICAL CHEMISTRY, Including Analysis.

With Numerous Illustrations. In one neat volume, royal 12mo.

GARDNER'S MEDICAL CHEMISTRY.

MEDICAL CHEMISTRY,

FOR THE USE OF STUDENTS AND THE PROFESSION;

BEING A MANUAL OF THE SCIENCE WITH ITS APPLICATIONS TO TOXICOLOGY, PHYSIOLOGY, THERAPEUTICS, HYGIENE &c.

BY D. PEREIRA GARDNER, M. D.

In one handsome royal 12mo. volume, with illustrations.

TAYLOR'S MEDICAL JURISPRUDENCE.

MEDICAL JURISPRUDENCE.

BY ALFRED S. TAYLOR,

SECOND AMERICAN, FROM THE THIRD AND ENLARGED LONDON EDITION.
With numerous Notes and Additions, and References to American Practice and Law.

BY R. E. GRIFFITH, M. D.

In one large octavo volume.

This work has been much enlarged by the author, and may now be considered as the standard authority on the subject, both in England and this country. It has been thoroughly revised, in this edition, and completely brought up to the day with reference to the most recent investigations and decisions. No further evidence of its popularity is needed than the fact of its having, in the short time that has elapsed since it originally appeared, passed to three editions in England, and two in the United States.

We recommend Mr. Taylor's work as the ablest, most comprehensive, and, above all, the most practically useful book which exists on the subject of legal medicine. Any man of sound judgment, who has mastered the contents of Taylor's "Medical Jurisprudence," may go into a court of law with the most perfect confidence of being able to acquit himself creditably.—*Medico-Chirurgical Review.*

The most elaborate and complete work that has yet appeared. It contains an immense quantity of cases lately tried, which entitle it to be considered what Beck was in its day.—*Dublin Medical Journal.*

TAYLOR ON POISONS.

ON POISONS,

IN RELATION TO MEDICAL JURISPRUDENCE AND MEDICINE.

BY ALFRED S. TAYLOR, F. R. S., &c.

EDITED, WITH NOTES AND ADDITIONS, BY R. E. GRIFFITH, M. D.

In one large octavo volume, of 688 pages.

The most elaborate work on the subject that our literature possesses.—*Brit. and For. Medico-Chirur Review.*

One of the most practical and trustworthy works on Poisons in our language.—*Western Journal of Med.*

It contains a vast body of facts, which embrace all that is important in toxicology, all that is necessary to the guidance of the medical jurist, and all that can be desired by the lawyer.—*Medico-Chirurgical Review.*

It is, so far as our knowledge extends, incomparably the best upon the subject; in the highest degree creditable to the author, entirely trustworthy, and indispensable to the student and practitioner.—*N. Y. Annalist.*

LARDNER ON HEAT, ELECTRICITY, &c.—(Now Ready.)

HANDBOOK OF

HEAT, MAGNETISM, COMMON ELECTRICITY, AND VOLTAIC ELECTRICITY.

BY DIONYSIUS LARDNER, LL. D., &c.

In one very neat volume, royal 12mo., with 250 illustrations, strongly bound in leather.

A good manual of the existing state of knowledge on these interesting and important subjects has long been a desideratum. This want the author has endeavored to supply in the present volume, and his name is a sufficient guarantee for its accuracy, fulness, and clearness. The additions of the editor have been mostly confined to the portion devoted to Heat, which may be considered as the most complete treatise on that subject accessible to the student in this country. It forms the second Course of Lardner's Handbooks of Natural Philosophy and Astronomy.

Just Issued—FIRST COURSE, containing Mechanics, Hydrostatics, Hydraulics, Pneumatics, Sound, and Optics, in one very large royal 12mo. volume, with 424 illustrations.

The **THIRD COURSE,** constituting a complete Treatise on Astronomy and Meteorology, is in preparation for early publication.

SCHOEDLER AND MEDLOCK'S BOOK OF NATURE—(Nearly Ready.)

THE BOOK OF NATURE;

AN ELEMENTARY INTRODUCTION TO THE SCIENCES OF

Physics, Astronomy, Chemistry, Mineralogy, Geology, Botany, Zoology, and Physiology

BY FREDERICK SCHOEDLER, PH. D.,

Professor of the Natural Sciences at Worms.

PREPARED BY HENRY MEDLOCK, F.C.S., &c.

WITH ALTERATIONS AND ADDITIONS BY THE AMERICAN EDITOR.

In one thick volume, small octavo, with over six hundred illustrations on wood.

DUNGLISON ON HUMAN HEALTH—HUMAN HEALTH, or the Influence of Atmosphere and L... Change of Air and Climate, Seasons, Food, Clothing, Bathing, Exercise, Sleep, &c. &c. &c., o... man; constituting Elements of Hygiene. Second edition, with many modifications and ad... Robley Dunglison, M. D., &c. &c. In one octavo volume of 464 pages.

BARCLEY ON CERTAINTY IN MEDICINE—An Inquiry into the Degree of Certain... and into the Nature and Extent of its Power over Disease. In one vol. royal 12mo. 84...

BEALE ON HEALTH.—The Laws of Health in Relation to Mind and Body. 1 vol. r...

GREGORY ON ANIMAL MAGNETISM.—Letters to a Candid Enquirer on Anim... royal 12mo.

DICKSON'S ESSAYS.—On Life, Sleep, Pain, Intellection, Hygiene, and Death. 1 vol...

THE GREAT AMERICAN MEDICAL DICTIONARY.

New and Enlarged Edition—(Now Ready.)

MEDICAL LEXICON;

A DICTIONARY OF MEDICAL SCIENCE,

Containing a Concise Explanation of the various Subjects and Terms of

PHYSIOLOGY, PATHOLOGY, HYGIENE, THERAPEUTICS, PHARMACOLOGY, OBSTETRICS, MEDICAL JURISPRUDENCE, &c.

WITH THE FRENCH AND OTHER SYNONYMES.

NOTICES OF CLIMATE AND OF CELEBRATED MINERAL WATERS;

Formulæ for various Officinal, Empirical, and Dietetic Preparations, &c.

BY ROBLEY DUNGLISON, M. D.,

Professor of Institutes of Medicine, &c. in Jefferson Medical College, Philadelphia, &c.

NINTH EDITION, REVISED.

In one very thick 8vo. vol., of 927 large double-columned pages, strongly bound, with raised bands,

Every successive edition of this work bears the marks of the industry of the author and [illegible] tion to keep it fully on a level with the most advanced state of medical science. [illegible] contained about NINE THOUSAND SUBJECTS AND TERMS not comprised [illegible] present has not less than FOUR THOUSAND not in any former edition. [illegible] therefore, embracing over FIFTY THOUSAND definitions, in all the departments of [illegible] meriting a continuance of the great favor and popularity which have carried [illegible] time, to an eighth edition.

Every precaution has been taken in the preparation of the present [illegible] cution and typographical accuracy worthy of its extended reputation. [illegible] sive additions have been accommodated, without materially increasing the [illegible] ment of a small but exceedingly clear type, cast for this purpose. The proof-sheets [illegible] care, and every effort used to insure the verbal accuracy so necessary to a work of this [illegible] is printed on fine white paper; and while this can be said in every respect to be a great [illegible] former issues, it is presented at the original exceedingly low price.

On the appearance of the last edition of this valuable work, we [illegible] peculiar merits, and we need do little more than state, in reference to the present, that notwithstanding the large additions previously made to it, no fewer than [illegible] preceding edition, are contained in the volume before us. We [illegible] erudition and industry. It is also a work of great practical [illegible] rience, for we keep it constantly within our reach, and rarely [illegible] finding in it the information we seek.—*British and Foreign Medico-Chirurgical Review.*

Dr. Dunglison's Lexicon has the rare merit of [illegible] curacy. A host of references. The terms generally [illegible] ser points, so much as the list of plain observers, the reader [illegible] but a few, which, while it [illegible] information. That we are not over-estimating the merits [illegible] have now before us the seventh edition. [illegible] per appreciation by the medical community, and we [illegible] most useful to the office of our medical readers.—*The London Medical Gazette.*

It is certainly more comprehensive and comprehensible [illegible] language. For, whether the [illegible] Lexicon, personal [illegible] its successful performance, [illegible] moved the necessity of [illegible] the various [illegible] progress of [illegible]—*American Medical Intelligencer.*

One of the most complete Medical Lexicons extant.—*Charleston Medical Journal.*

The most extensive Medical Dictionary in the English language.—*[illegible]*

Dr. Dunglison's Medical Lexicon has long since established for itself a character which [illegible] Medical Student.—*Medical Examiner.*

For the student, the practitioner, and the general reader, this work is invaluable.—*Western Lancet.*

We have often had occasion to speak in the very best terms of Dr. Dunglison's Medical Lexicon, and Surgeons' Journal.

The most comprehensive and best English Dictionary of Medical Terms.—*[illegible]*

HOBLYN'S MEDICAL DICTIONARY.

A DICTIONARY OF THE TERMS USED IN MEDICINE

AND THE COLLATERAL SCIENCES

BY RICHARD D. HOBLYN, A. M.

REVISED, WITH NUMEROUS ADDITIONS, FROM THE [illegible] EDITION,

BY ISAAC HAYS, M. D., &c. In one large royal [illegible]

We can most strongly recommend this work to all [illegible] reader.—*Medico-Chirurgical Review.*

LANE MEDICAL LIBRARY

To avoid fine, this book should be returned on
or before the date last stamped below.

M31 Miller, J. 54025
M64 The practice of
1853 surgery.

NAME | DATE DUE

ATTIC

ATTIC